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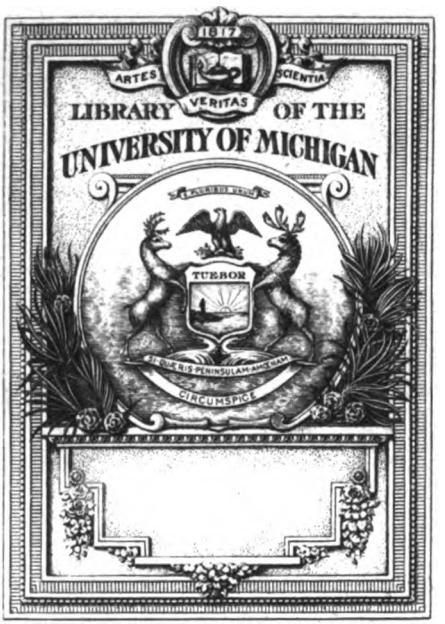
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ROYAL BOTANIC GARDENS, KEW.

BULLETIN

OF

MISCELLANEOUS INFORMATION

1906.



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ROYAL BOTANIC GARDENS, KEW.

BULLETIN

OF

MISCELLANEOUS INFORMATION.

No. 1. 1906.

I.—DECADES KEWENSES

PLANTARUM NOVARUM IN HERBARIO HORTI REGII CONSERVATARUM.

DECADES XXXVI.-XL.

351. **Actinidia curvidens**, *Dunn* [Ternstrœmiaceæ-Saurauieæ]; species *A. Kolomictæ*, Maxim., affinis, foliis baccisque maculatis distincta.

Frutex scandens, ramulis glabris pallidis lenticellatis. *Folia* chartacea, præter floccos in nervorum primariorum axillis mox glabra, oblongo-lanceolata vel ovata, 3–4 poll. longa, acuminata, serraturarum apiculis prorsum directis; nervi prominentes. *Flores* sæpius solitarii, 6 lin. diam.; pedunculi 6–7 lin. longi. *Sepala* oblonga, obtusa, petalis circiter 2-plo breviora. *Petala* ovato-lanceolatæ, staminibus paullum longiora. *Ovarium* vel rudimentum lanatum. *Bacca* glabra, cylindrica, obtusa, maculata. *Semina* minute tuberculata.

CHINA. Neighbourhood of Ichang, *A. Henry*, 3471, 3494, 3564, 3955, 4377.

352. **Actinidia Henryi**, *Dunn* [Ternstrœmiaceæ-Saurauieæ]; species *A. strigosæ*, Hook. f. & Thoms., affinis sed foliis subglabris, ramulis floriferis brevibus villosis, baccisque parvis maculatis distincta.

Frutex alte scandens (*A. Henry*), caule striato glabro. *Ramuli* floriferi dense rubro-villosi, alii longi, foliosi, alii brevissimi, flores solum gerentes. *Folia* chartacea, tandem omnino glabra, subtus glauca, lanceolata vel oblongo-ovata, 3–7 poll. longa, acuminata, basi nunc rotundata nunc cordata, minute serrulata, nervis

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primum supra puberulis, infra prominentibus rubro-lanatis; petioli laxe hirsuti, laminis 4-plo breviores. *Flores* 5 lin. diam.; pedunculi uniflori, 3–5 lin. longi. *Sepala* orbicularia, pubescentia, petalis duplo breviora. *Petala* alba (*A. Henry*), ovata, basi cuneata, staminibus vix longiora. *Ovarium* vel rudimentum lanatum. *Bacca* cylindrica, obtusa, subglabra, 6–10 lin. longa, 2½–4 lin. lata. *Semina* compressa, granulata.

CHINA. Mountains and forests S. and S.E. of Mengtze, Yunnan, 5000–6000 ft., *A. Henry*, 10,381, 11,307, 13,335.

353. **Actinidia rubricaulis**, *Dunn* [Ternstrœmiaceæ-Saurauieæ]; ab *A. callosa*, Lindl., differt foliorum ambitu, florum magnitudine et ovariis præter verticem glabris.

Frutex alte scandens (*A. Henry*), omnino glaber. *Ramuli* rubescentes, lenticellati. *Folia* chartacea, oblongo-lanceolata, 3–4 poll. longa, acuminata, basi rotundata, subtiliter serrulata, nervis haud prominentibus. *Flores* 6 lin. diam.; pedunculi sæpissime uniflori, 6–10 lin. longi. *Sepala* oblonga, obtusa, dimidium petalorum paullum superantia. *Petala* lanceolata, staminibus bis longiora. *Ovarium* vel rudimentum præter lanam circa stylos glabrum. *Bacca* ovata, glabra, maculata, 7 lin. longa.

CHINA. Mengtze forests and Feng-chen-lin mountain forest S. of Red River, Yunnan, 7000 ft., *A. Henry*, 10,696, 11,334.

354. **Connaropsis acuminata**, *H. H. W. Pearson* [Geraniaceæ]; affinis *C. Griffithii*, Planch., a qua præcipue panicula axillari brevi, et foliolis minoribus recedit.

Arbor vel frutex. *Rami* novelli ferrugineo-pubescentes, tandem glaberrimi, cinerei, lenticellis multis instructi. *Folia* pinnata, trifoliolata, glaberrima; rhachis 1–1½ poll. longa, apice paulo dilatata; foliola coriacea, elliptico-lanceolata, acuminata, basi rotundata, nervis secundariis utrinque 6, terminalia 4½–5 poll. longa, 1–1½ poll. lata, lateralia 1½–2½ poll. longa, ½–¾ poll. lata. *Panicula* axillaris, laxa, ferrugineo-pubescens, 1½–2 poll. longa. *Sepala* lanceolata, acuminata, obtusa, extus puberula, intus glabra, 2 lin. longa. *Petala* lanceolata, obtusa, glabra, hyalina, 3 lin. longa, nervis parallelis. *Antheræ* ovatæ. *Filamenta* basi flabelliformia. *Ovarium* turbinatum, glabrum. *Styli* 5 reflexi, basi parce strigosi. *Fructus* ignotus.

BORNEO. Sandaken, *Ridley*, 9,057.

355. **Evodia colorata**, *Dunn* [Rutaceæ-Zanthoxyleæ]; *E. fraxinifoliæ*, Hook. f., affinis, fructu distincta.

Arbor 8–20-pedalis (*A. Henry*). *Folia* opposita, imparipinnata, 4–5-juga, 7–18 poll. longa; foliola petiolulata, papyracea, basi infra obscure hirtella, ovata vel lanceolata, obtuse acuminata, 2–6 poll. longa, integra, venulis haud prominentibus. *Flores* polygami, in corymbos terminales dispositi, 2 lin. longi, tetrameri,

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Calyx molliter pubescens, ½ lin. longus, dentibus latis obtusis. *Petala* lutea (*A. Henry*), calycem 3-plo excedentia. *Stamina* in floribus ♂ petala excedentia, ovarii rudimentum cingentia. *Ovarium* in floribus ♀ 4-lobum, cum gynophoro brevi stylum æquans; stigma 4-lobum, petala excedens. *Capsulæ* valvæ coriaceæ, rubræ (*A. Henry*); semina nigra (*A. Henry*) depresso-globosa, lucida, 3 lin. diam.

CHINA. Yunnan: Szemao forests, 5000 ft., *A. Henry*, 12,137, 12,137A, 12,137B, 12,137C.

356. **Euthemis ciliata**, *H. H. W. Pearson* [Ochnaceæ]; affinis *E. minori*, Jack, a qua stylo staminibus breviore, stipulis deltoideis acuminatis et foliis basi minus angustatis differt; etiam ab *E. obtusifolia*, Hook. f. (cujus flores ignoti sunt), stipulis deltoideis, et foliis basi minus cuneatis recedit.

Frutex ramis atris, glaberrimis. *Folia* brevi-petiolata, lineari-lanceolata, basi cuneata, apice obtusa, mucronata, intra marginem obscure spinuloso-serratulum incrassata, nervis permultis curvatis instructa; petioli supra sulcati, 2–3 lin. longi; laminæ 2½–3½ poll. longæ, ¾–1 poll. latæ. *Stipulæ* oblique deltoideæ, caudato-acuminatæ, glanduloso-ciliatæ, 1¼–1½ lin. longæ, ½–¾ lin. latæ. *Racemus* simplex, erectus, primo terminalis, tandem lateralis, 4 poll. longus, nodis 2–3-floris. *Alabastra* conica, acuminata, 2⅓–3 lin. longa. *Sepala* breviter spathulata, parce inæqualiterque ciliata, 1¼–1½ lin. longa, ¾ lin. lata. *Petala* ovato-lanceolata, acutiuscula, sub anthesi reflexa, 2½–3 lin. longa, 1–1¼ lin. lata. *Stamina* subsessilia, libera, acuminata, 2 lin. longa; staminodia deficientia. *Discus* 5-angulatus. *Ovarium* conicum, 5-angulatum, 5-loculare. Stylus brevis, filiformis; stigma simplex minutum. *Bacca* ignota.

SUMATRA. Penasa Siak, *Ridley*, 9000.

357. **Guarea syringoides**, *C. H. Wright* [Meliaceæ]; ex affinitate *G. pedicellatæ*, C.DC., qua foliis cuspidatis recedit.

Arbor robusta. *Ramuli* furfuracei, siccitate minute sulcati. *Folia* 2-3-juga; foliola opposita 4 poll. longa, 2¼ poll. lata, ovata, glabra, basi apiceque breviter acuminata, integra, nervis secundariis 4–6-jugis, petiolulis semipollicaribus. *Paniculæ* angustæ, laxifloræ; pedicelli tenues, 2 lin. longi. *Calyx* ⅓ lin. longus, 4-dentatus. *Petala* oblonga, obtusa, glabra, 2 lin. longa, ⅔ lin. lata. *Staminum* tubus petalis paullo brevior, apice minutissime lobatus. *Ovarium* ovoideum, glabrum, gynophoro brevi suffultum; stylus subulatus, tubo staminum exsertus; stigma discoideum.

ECUADOR. *Eggers*, 15,602, 15,718.

358. **Swintonia puberula**, *H. H. W. Pearson* [Anacardiaceæ]; affinis *S. Helferi*, Hook. f., a qua præcipue panicula crassiore puberulaque, foliis minoribus, petiolo supra bicaniculato differt.

Arbor ramis novellis atris in longitudinem canaliculatis. *Folia* petiolata; laminæ membranaceæ, utrinque concolores,

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glaberrimæ, elliptico-lanceolatæ, acuminatæ, obtusæ, basi cuneatæ paulo secus petiolos decurrentes, marginibus undulatis, nervis lateralibus præcipuis 12–20 tenuibus arcuatim patentibus 3½–6 poll. longæ; petioli semiteretes, supra bicanaliculati, 1½–2¼ poll. longi. *Panicula* foliis paulo longior, ramis crassis, minute puberula. *Flores* brevissime pedicellati. *Calycis* tubus brevis, obconicus, extus rugosus, 1 lin. longus; lobi semiorbiculares, fimbriati. *Petala* oblongo-ovata, obtusa, crassiuscula, intus minute pubescentia, extus puberula, accrescentia, 2·5–3 lin. longa. *Staminum* filamenta petalos æquantia; antheræ albæ. *Ovarium* ovoideum, parce strigosum, tandem glabrescens, ¾–1 lin. longum; stylus ovario bis longior. *Drupa* ignota.

PERAK. Bujong-Malacca, *Ridley*, 9650.

359. **Semecarpus cinerea**, *H. H. W. Pearson* [Anacardiaceæ]; affinis *S. australiensi*, Engl., a qua præcipue floribus 6-meris pedicellatis majoribus et foliis virido-cinerascentibus minoribus differt.

Arbor ramulis novellis pallidis teretibus fusco-puberulis. *Folia* alternata, subcoriacea, integra, elliptica, lanceolata, obtusa vel breviter acuta, apiculata, basi cuneata, paullum decurrentia, supra glabra, nitentia, virido-cinerascentia, margine crassiusculo undulato, nervis lateralibus utrinque 6–8 arcuatim adscendentibus, venis reticulatis prominentibus, secundum nervos purpurascentia, costa depressa, subtus (nervis exceptis) squamis minutis argenteis dense vestita nervis puberulis; lamina 3–5¼ poll. longa, 1½–2¼ poll. lata; petiolus ½–1 poll. longus, supra sulcatus. *Panicula* ampla, axillaris, fusco-pubescens, foliis brevior. Bracteæ subulatæ, fusco-pubescentes, 1½–2 lin. longæ. *Flores* ♀ pedicellati, 2 lin lati. *Calycis* tubus 6-dentatus, brevis, extus dense fusco-pubescens. *Petala* 6, imbricata, libera, triangulo-ovata, 1–1½ lin. longa, basi paullum attenuata et extus puberula, intus glabrescentia, nervis atris parallelis, margine hyalino angusto. *Stamina* 6, imperfecta, filamentis infra dilatatis ¾–1 lin. longis. *Discus* intrastaminalis, annularis, intus strigosus. *Ovarium* liberum, globoso-ovoideum, dense strigosum. *Styli* 3, depressi, stigmatibus magnis atris bilobis. *Ovulum* infra apicem loculi suspensum. *Drupa* immatura pubescens vel glabrescens.

COAST OF MALAY PENINSULA. Carimon Islands, *Ridley*, 7115.

360. **Eugenia Prora**, *Burkill* [Myrtaceæ-Myrteæ]; foliis longissime acuminatis (hinc nomen dedi) inter species insularum maris pacifici facile distincta.

Frutex 12–25 ped. altus (*fide Horne*). *Rami* siccati cortice cinnamomeo, fere læves. *Folia* ovato-elliptica, glabra, supra nitida, basi angustata, longissime acuminata ad apicem rotundata, nervis lateralibus sat conspicuis numerosis fere rectis nervo submarginali conjunctis, 2¼–3 poll. longa, 11–14 lin. lata; acumen ad 8 lin. longum; petiolus 5–7 lin. longus. *Panicula* corymbiformis, sub anthesin 2 poll. diam., fructu maturo multo auctus, circa 5 poll. diam.; pedunculi et pedicelli quadrangulares;

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bracteæ subulatæ, cite deciduæ. *Alabastra* elongato-pyriformia, sub anthesi ⅛ poll. longa. *Sepala* indistincta, annulum formantia. *Petala* sub anthesi lacerata, caduca. *Stamina* roseo-purpurea; filamenta 2 lin. longa. *Fructus* elongato-ovoideus, ¾ poll. longus, 2½–3 lin. diam., calyce coronatus, venis notatus.

FIJI ISLANDS. Viti Levu, near Namosi, in mountain forests; *Horne*, 774, 874, and without precise locality, *Yeoward*, 41.

361. **Dissochaeta pentamera**, *Burkill* [Melastomaceæ]; e sectione *Diplostemonis* species distinctissima.

Frutex scandens. *Rami* quadrangulares, siccitate sulcati, ad nodos conspicue tumidi, annulati, glabri. *Folia* ovato-orbicularia, 9-nervia, apice obtusissima, basi subcordata, glabra, 3–3½ poll. longa, 2¾–3¼ poll. lata, margine dentibus minutis papilliformibus perpaucis instructa; petiolus 1¼–1½ poll. longus. *Panicula* laxiflora, ad 5 poll. longa, ad 4 poll. diam.; bracteæ minutæ. *Calyx* truncatus, denticulis 5 punctiformibus auctus, glaber. *Petala* ovata, subacuminata, 5 lin. longa, violacea. *Stamina* 10; antheræ incurvæ, apice obtusæ, 1-porosæ, fere 3 lin. longæ, calcare vix ⅓ lin. longo. *Ovarium* 5-loculare, vertice glabrum; stylus filiformis, apicem versus hamatus, staminibus longior.

BRITISH NEW GUINEA. Between the south coast and the Owen Stanley mountains, *Burke*, 372.

362. **Bidens simplicifolia**, *C. H. Wright* [Compositæ-Helianthoideæ]; a speciebus reliquis Austro-Americanis foliis indivisio ovatis acuminatis differt.

Frutex scandens. *Rami* tereti, leviter striati, glabri. *Folia* ovata, acuminata, serrata, utrinque minute papillosa, basi primum rotundata, deinde ad petiolum decurrentia, 2¼ poll. longa, 1¾ poll. lata; petiolus 6 lin. longus. *Pedunculi* 2 poll. longi. *Bracteæ* oblongæ, acutæ, scarioso-margiuatæ. *Paleæ* receptaculi lineares, acutæ. *Flores* radii lutei. *Corolla* 3 lin. lata. *Flores* disci 5 lin. longi. *Achænia* compressa, 5 lin. longa, leviter striata, marginibus ciliatis; aristæ 2–2½ lin. longæ.

ECUADOR. *Eggers*, 15,725.

363. **Cuscuta (§Monogynella) Upcraftii**, *H. H. W. Pearson* [Convolvulaceæ]; a *C. lupuliformi*, Krocker, præcipue floribus minoribus, stylo breviore bifido et ovario globoso differt.

Caules tenuiter filiformes. *Spica* laxa, pauciflora, simplex, nodis 2–3-floris, ½–¾ poll. longa. *Flores* sessiles, 1–2 lin. longi. *Calyx* late campanulatus, alte partitus, membranaceus; lobi imbricati, concavi, late triangulares, nonnunquam paulo auriculati, apice rotundati, ¾ lin. longi, 1 lin. lati. *Corollæ* tubus cylindricus, calyce fere bis longior; laciniæ ellipticæ, obtusæ, tubo breviores, per anthesin patulæ vel reflexæ. *Antheræ* ovatæ, fauci subsessiles. *Squamæ* oblongæ, laciniato-fimbriatæ, fere medio tubo adnatæ, inclusæ, conniventes. *Ovarium* globosum, apice depressum; stylus apice bifidus, ovario paulo longior, lobis stigmatibus

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ovatis. *Capsula* ovata, obtusa, 1-sperma, 2–3 lin. longa; semen semiorbiculare, lineis brevibus tenuissimis ornatum, 1½ lin. diam.

EAST TIBET, between Tachienlu and Batang, 9000–14,000 ft., *Upcraft*.

The seeds from which this specimen was grown were collected by Mr. W. M. Upcraft, an American Missionary, in 1898. They were germinated by Mr. A. K. Bulley, and the seedlings successfully grown on potato plants. The natural host is unknown.

By its bifid style this species is also allied to the North American *C. exaltata* Engelm., of which Engelmann says "This is the only species of this section (Monogynella) where the styles are not completely united."

364. **Achatocarpus pubescens**, *C. H. Wright* [Amarantaceæ]; folia late elliptica vel suborbicularia, subtus pubescentia.

Arbor 12-pedalis. *Ramuli* pubescentes, cinerei. *Folia* late elliptica vel suborbicularia, 2½ poll. longa, 1¾ poll. lata, supra glabra, siccitate nigrescentia, subtus pubescentia, basi in petiolum 3 lin. longum attenuata. *Paniculæ* multifloræ. *Flos* ♂: Perianthii lobi ovales, concavi, imbricati, virescentes. *Filamenta* longa, tenuia; antheræ oblongæ. *Flos* ♀: Perianthii lobi ovales, imbricati, exteriores minores. *Ovarium* ovale, compressum; styli recurvi, ovario longiores.—*A. præcox*, Schinz et Autran in Bull. Herb. Boiss. i. p. 6, ex parte, non Griseb.

ECUADOR. Guayaquil, *Jameson*, 528; without exact locality, *Eggers*, 15503.

365. **Spathanthus Jenmani**, *N. E. Brown* [Rapateaceæ]; a *S. unilaterale*, Desv., foliis basi cordatis recedit.

Folia longe petiolata, glabra; petiolus supra vaginam 8–9 poll. longus; lamina 2 ped. longa vel ultra, 2½–3 poll. lata, ligulata, acuta, basi inæqualiter cordata. *Pedunculi* usque ad 15 poll. longi, subcompressi, glabri. *Spatha* 2¼–3¾ poll. longa, 1 poll. lata, navicularis, acuta, glabra. *Spadix* 1–1¾ poll. longus, spathæ dorso adnatus, densissime multiflorus. *Bracteæ* 4½ lin. longæ, ⅓ lin. latæ, lineares vel lineari-spathulatæ, apice concavæ, obtusæ, apiculatæ. *Flores* immaturi.

BRITISH GUIANA. Waratuk Path, Potaro River, *Jenman*, 7468.

366. **Aristolochia (Gymnolobus) dæmoninoxia**, *Masters* [Aristolochiaceæ]; affinis *A. Ruizianæ*, Duchartre, floribus minoribus, et perianthii tubo magis ventricoso intus superne glandulis duabus magnis applanatis munito differt.

Frutex scandens, cortice suberoso profunde longitudinaliter rimoso. *Folia* remotiuscula; petioli ad 2½ poll. longi; laminæ circiter 5 poll. longæ et 6 poll. latæ, subcoriaceæ, glabræ, subtus setis albidis dense obtectæ, ovatæ, acutæ vel suborbiculares, 5-nerviæ;

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lobi basales rotundi, late divergentes. *Inflorescentia* pluriflora, e ramis lignosis enascens. *Perianthium* 1-labiatum, ecaudatum, cum tubo circiter 3 poll. longum; tubus basi ventricosus, intus superne glandulis duabus magnis applanatis munitus, medio arcte sursum flexus, in limbum unilateralem 2–2½ poll. latum dilatatus. *Gynandrophorum* 6-lobum, lobis oblongis obtusis ad margines recurvatis. *Antheræ* lineares oblongæ, tubo gynandrophori parum breviores. *Capsula* circiter 4 poll. longa, linearioblonga, obtusa, 6-valva. *Semina* circiter ¼ poll. longa, oblonga, retusa, complanata, anguste alata, dorso convexa, ventre concava, nervo medio prominente signata.

BRITISH GUIANA. Demerara, *Jenman*, 6915.

Known to the Indians as "Boehari," which means "devil-doer."

367. **Aristolochia (Gymnolobus) consimilis**, *Masters* [Aristolochiaceæ]; *A. rumicifoliæ*, Mart. et Zucc., haud dissimilis, foliis autem basi nec dilatatis et peranthii limbo suborbiculari.

Frutex scandens, hirtus, cortice suberoso. *Petioli* ¾ poll. longi; laminæ circiter 5 poll. longæ, 2½ poll. latæ, subcoriaceæ, superne glabrescentes, oblongæ, acuminatæ, basi cordatæ, lobis rotundatis parallelis, 5-neviæ, nervis secundariis transversis parum remotis. *Inflorescentia* axillaris, gracilis, ad 2 poll. longa, bracteis foliaceis sparsis ovato-acuminatis prædita. *Perianthium* 1-labiatum, caudatum, circiter 1¼ poll. longum, basi ventricosum, intus glabrum, inter partem ventricosam et partem tubulosam lamina membranacea deflexa uno latere onustum, tubo parum curvato gracili cylindrico superne in limbum 1-labiatum suborbicularem circiter ½ poll. diam. expansum. *Gynandrophori* lobi oblongi, obtusi, ad margines revoluti.

BRITISH GUIANA. Demerara River, *Jenman*, 6916.

368. **Xanthosoma cordatum**, *N. E. Brown* [Aroideæ-Colocasieæ]; affinis *X. blando*, Schott, sed foliis cordatis facile distinguitur.

Folia magna, glabra; petioli 2 ped. longi vel ultra, brunneo-violacei, ad apicem vaginati; laminæ usque 1¾ ped. longæ, 1¼ ped. latæ, cordatæ, acutæ; lobi basales semiorbiculati; nervi primarii laterales utrinque 6–8; costæ basales in sinu denudatæ, quam lobi basales triplo breviores, ad apicem 3–4 ramosi et latere uno nervos primarios 3–4 emittentes. *Pedunculus* 9–11 poll. longus, compressus, superne pallide virens, inferne ferrugineo-tinctus. *Spathæ* tubus subglobosus, 1¾ poll. diam., utrinque viridis, extra leviter pruinosus; lamina 6 poll. longa, oblongo-cymbiformis, acuminata, extra flavo-virens, inferne roseo-tincta, intus albida. *Spadix* quam spatha brevior; pars feminea 1 poll. longa, flavida; pars neutra 1¾ poll. longa, rosea; pars mascula 3½ poll. longa, albida.

BRITISH GUIANA. Described from a plant cultivated at Kew.

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369. **Alsophila costularis,** *Baker* [Filices-Cyatheaceæ]; habitus et pinnæ omnino *A. contaminantis*, Wall.; recedit costis pinnulorum dorso pilosis, soris costalibus.

Caudex ad 20 pedes attingens. *Lamina* ampla, deltoidea, tripinnatifida vel tripinnata, dorso pallide viridis haud glauca, ultra costas pinnularum glabra; rhachis primaria valida, inermis, nuda, pallide brunnea; pinnæ oblongo-lanceolatæ, sessiles, bipedales; pinnulæ lanceolatæ, sessiles, inferiores 3½–4 poll. longæ, 7–8 lin. latæ, ad basin pinnatæ, lobis tertiariis linearioblongis 1½ lin. latis leviter serratis; venæ 10–12-jugæ, profunde furcatæ. *Sori* costales, ad basin venarum impositi, haud conferti.

CHINA. Yunnan: forests of Szemao, at 6000 ft., *Henry*, 13,136.

370. **Davallia (Leucostegia) rigidula,** *Baker* [Filices-Polypodiaceæ]; ad *D. affinem*, Hook., accedit; differt frondibus rigidulis, paleis basalibus haud acuminatis et soris supra medium segmentorum ultimorum impositis.

Rhizoma late repens, 3 lin. diam., paleis ovatis imbricatis subacutis vel obtusis membranaceis pallide brunneis vestitum. *Stipites* graciles, remoti, 6–9 poll. longi, straminei, infra parce paleacei. *Lamina* deltoidea, decomposita, rigidula, pedalia, utrinque viridis, glabra; rhachis primaria gracilis, nuda; pinnæ deltoideæ, petiolatæ; basales reliquis multo majores, ad latus inferius productæ; segmenta ultima linearia vel spathulata, acuta, 1–1½ lin. longa. *Sori* ad segmenta ultima solitarii vel bini, prope apicem impositi. *Indusium* orbiculare, glabrum, pallidum, ½ lin. diam.

CHINA. Yunnan: Mengtze and Szemao, on rocks at 5000 ft., *Henry*, 10,333, 13,069.

371. **Davallia (Eudavallia) henryana,** *Baker* [Filices-Polypodiaceæ]; ad *D. griffithianam*, Hook., accedit; differt soris minoribus prope basin segmentorum ultimorum impositis.

Rhizoma late repens, 3 lin. diam., paleis ascendentibus imbricatis linearibus scariosis albidis vestitum. *Stipites* remoti, graciles, nudi, pallidi, 3–8 poll. longi. *Lamina* deltoidea, tripinnata, 3–12 poll. longa, rigida, utrinque glabra; rhachis gracilis, nuda; pinnæ superiores lanceolatæ, ad basin inferiorem reductæ, cuneatæ; basales reliquis multo majores, ad latus inferius productæ; segmenta ultima lineari-oblonga, inferiora profunde pinnatifida; venæ occultæ, immersæ. *Sori* solitarii, prope basin segmentorum ultimorum impositi. *Indusium* orbiculare, glabrum, pallidum, ½ lin. diam.

CHINA. Yunnan: mountains to the east of Szemao, in forests at 5000 ft., *Henry*, 10,082.

373. **Cheilanthes (Aleuritopteris) subrufa,** *Baker* [Filices-Polypodiaceæ]; inter *C. farinosam*, Kaulf., et *C. rufam*, D. Don, medium tenens.

Caudex erectus; paleæ basilares lineares, densæ, concolores. *Stipites* 2–4 poll. longi, cæspitosi, ubique paleacei. *Lamina*

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subdeltoidea, bipinnata, 5–6 poll. longa, ad basin 3½–4 poll. lata, facie viridis, glabra, dorso albo-cerata; rhachis ad apicem paleacea; pinnæ sessiles, lanceolatæ; basales reliquis majores, ad latus inferius productæ; pinnulæ lineares, obtusæ, inferiores crenatæ. *Sori* contigui. *Indusium* latum, pallidum, persistens, sæpe fimbriatum.

CHINA. Yunnan: mountains to the north of Mengtze, at 7000 ft., *Henry*, 11,831.

374. **Lomaria (Plagiogyria) decurrens**, *Baker* [Filices-Polypodiaceæ]; ab speciebus reliquis hujus stirpis recedit frondibus lanceolatis ad basin sensim attenuatis.

Caudex erectus. *Stipites* cæspitosi, castanei, basi incrassati, angulati, frondium sterilium 4–5 poll. longi, fertilium 12–15 poll. longi. *Lamina* sterilis lanceolata, membranacea, simpliciter pinnata, 15–16 poll. longa, medio 2–3 poll. lata, ad basin sensim attenuata; pinnæ centrales lanceolatæ, contiguæ, 12–18 lin. longæ, infra 4–5 lin. latæ, per basin totam adnatæ, supra serratæ; venæ laxæ, perspicuæ, simplices vel furcatæ. *Lamina* fertilis pinnis angustioribus haud contiguis instructa.

CHINA. Yunnan: mountains to east of Mengtze, at 6000 ft., *Henry*, 9036.

375. **Asplenium (Athyrium) sinense**, *Baker* [Filices-Polypodiaceæ]; inter *A. thelypteroidem*, Michx., et *A. nigripedem*, Blume, medium tenens.

Caudex haud visus; paleæ basilares lineares, firmulæ, atro-castaneæ. *Stipites* graciles, straminei, subpedales, supra basin nudi. *Lamina* oblongo-lanceolata, bipinnata, pedalis, 5–6 poll. lata, membranacea, utrinque viridis, glabra; pinnæ lanceolatæ, sessiles, basi truncatæ, 3–3½ poll. longæ, 9–10 lin. latæ; inferiores haud reductæ; pinnulæ oblongæ, obtusæ, dentatæ, 2–3 lin. latæ, ad basin superiorem rectæ, productæ, subauriculatæ, ad basin inferiorem reductæ, cuneatæ; venæ ad lobos basales pinnularum pinnatæ. *Sori* 5–6-jugi, costales, paralleli, 2 lin. longi. *Indusium* membranaceum, glabrum, persistens.

CHINA. Yunnan: mountain forests to the north of Mengtze, *Henry*, 10,101.

376. **Asplenium (Diplazium) parallelosorum**, *Baker* [Filices-Polypodiaceæ]; ad *A. sylvaticum*, Presl., magis accedit; differt pinnis angustioribus, venulis 2–3-jugis et soris inter costam et marginem uniseriatis.

Caudex erectus; paleæ basilares lineares, densissimæ, atro-brunneæ, membranaceæ, magnæ. *Stipites* erecti, 3–4 poll. longi, paleis squarrosis vestiti. *Lamina* oblongo-lanceolata, ad basin attenuata, 12–15 poll. longa, medio 6–7 poll. lata, membranacea, viridis, glabra; rhachis primaria inferne paleacea; pinnæ sessiles, lanceolatæ, profunde crenatæ, centrales 3–3½ poll.

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longæ, inferne 6–7 lin. latæ; inferiores sensim minores; infimæ deflexæ; venæ pinnatæ, venulis ascendentibus 2–3-jugis. *Sori* lineares, basales, inter costam et marginem uniseriati. *Indusium* angustum, membranaceum, glabrum, sæpe diplazioideum.

CHINA. Yunnan: mountain forests to the east of Mengtze, at 6000 ft., *Henry*, 10,103.

377. **Asplenium (Diplazium) leptophyllum**, *Baker* [Filices-Polypodiaceæ]; inter *A. squamigerum*, Mett., et *A. latifolium*, D. Don, medium tenens.

Caudex erectus; paleæ basilares lanceolatæ, castaneæ. *Stipites* debiles, erecti, sesquipedales, nudi vel parce paleacei. *Lamina* magna, deltoidea, tripinnatifida, membranacea, viridis, glabra; pinnæ inferiores reliquis majores, petiolatæ, deltoideæ, 8–10 poll. longæ; pinnulæ sessiles, oblongo-lanceolatæ, profunde pinnatifidæ, segmentis tertiariis oblongis obtusis serratis 2–3 lin. latis; venæ in segmentis tertiariis copiose pinnatæ, venulis inferioribus furcatis. *Sori* ad costam approximati, lineares, 2 lin. longi. *Indusium* glabrum, membranaceum, viridulum, persistens.

CHINA. Yunnan: Szemao, in forests, *Henry*, 13,106.

378. **Nephrodium (Lastrea) cyclodioides**, *Baker* [Filices-Polypodiaceæ]; ad *N. podophyllum*, Hook., magis accedit; differt pinnis multo majoribus, venulis 5–6-jugis et soris minutis.

Stipites ignoti. *Lamina* magna, rhomboidea, simpliciter pinnata, chartacea, utrinque viridis, glabra; costa straminea, nuda; pinnæ 3-jugæ, sessiles, ascendentes, lanceolatæ, 9–12 poll. longæ, medio 18–21 lin. latæ, acutæ, basi cuneatæ, ad apicem obscure serratæ. *Venæ* pinnatæ, liberæ, venulis remotis ascendentibus 5–6-jugis. *Sori* globosi, minuti, superficiales, ad venas mediales positi. *Indusium* parvum, glabrum, evanescens.

CHINA. Yunnan: Mengtze, mountains above the Red river. at 7000 ft., *Hancock*, 155.

379. **Nephrodium (Lastrea) microlepis**, *Baker* [Filices-Polypodiaceæ]; a *N. hirtipede*, Hook., recedit pinnis ad medium pinnatifidis et indusio parvo evanescente.

Caudex erectus. *Paleæ* basilares lanceolatæ, magnæ, membranaceæ, pallide brunneæ. *Stipites* subpedales, straminei, parce paleacei. *Lamina* oblongo-lanceolata, bipinnatifida, 15–18 poll. longa, 5–6 poll. lata, papyracea, utrinque viridis, glabra; rhachis primaria paleis lineari-subulatis brunneis vestita; pinnæ lanceolatæ, ad medium pinnatifidæ, centrales 2½–3 poll. longæ, 8–2 lin. latæ; basales haud reductæ; lobi oblongi, obtusi, obscure crenati, 2 lin. lati; venæ pinnatæ, venulis simplicibus ascendentibus 4–5-jugis. *Sori* mediales. *Indusium* parvum, membranaceum, evanescens.

CHINA. Yunnan: forests to the south of Szemao, at 5000 ft., *Henry*, 13,154.

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380. **Nephrodium (Eunephrodium) subelatum,** *Baker* [Filices-Polypodiaceæ]; ad *N. elatum*, Baker (*N. mauritianum*, Fée,) accedit; differt pinnis minus sectis et indusio persistente magnitudine mediocri.

Rhizoma repens; paleæ basilares lanceolatæ, densæ, sordide brunneæ. *Stipites* pedales et ultra, pubescentes, facie canaliculati, infra parce paleacei. *Lamina* oblonga, tripinnatifida, 2–3 pedes longa, medio 12–15 poll. lata, chartacea, utrinque viridis, facie ultra costas glabra, dorso ubique pubescens; rhachis primaria pubescens, haud paleacea; pinnæ sessiles, lanceolatæ, centrales 7–8 poll. longæ, infra 12–13 lin. latæ, ad medium haud pinnatifidæ, lobis oblongis 2 lin. latis; infimæ remotæ, valde reductæ; venulæ simplices, perspicuæ, 10–12-jugæ. *Sori* mediales *Indusium* firmum, glabrum, persistens.

CHINA. Yunnan: Szemao, rare at 4000 ft., *Henry*, 11,809.

381. **Nephrodium (Sagenia) Morsei,** *Baker* [Filices-Polypodiaceæ]; ad *N. tripartitum*, Baker, accedit, differt stipitibus pallidis et soris minoribus ad venas primarias magis approximatis.

Caudex ignotus; paleæ basilares lanceolatæ, firmulæ, sordide brunneæ. *Stipites* 6–15 poll. longi, straminei, graciles, supra basin nudi. *Lamina* deltoidea, 6–8 poll. longa, viridis, dorso pilosa, profunde trilobata, lobo centrali quam basilaribus majore integro vel crenato ovato acuminato 2½–3 poll. lato; venæ primariæ ad marginem productæ, parallelæ; areolæ intermediæ copiosæ, venulis liberis productis. *Sori* biseriales, ad venas primarias approximati. *Indusium* firmum, glabrum.

CHINA. Kiang-si: Lungchow, *Morse*, 51.

382. **Nephrodium (Sagenia) yunnanense,** *Baker;* [Filices-Polypodiaceæ]; inter *N. latifolium*, Baker, et *N cicutarium*, Baker, medium tenens.

Stipites elongati, graciles, subnudi, castanei; paleæ lineares, brunneæ, membranaceæ. *Lamina* deltoidea, magna, membranacea, bipinnatifida, utrinque viridis, facie glabra, dorso ad costam castaneam pubescens; pinnæ infimæ deltoideæ, pedales et ultra, ad latus inferius productæ, breviter petiolatæ, profunde pinnatifidæ, lobis secundariis plerisque ovato-lanceolatis acutis integris, infimis sinuatis vel pinnatifidis; venæ primariæ erecto-patentes, margini parallelæ; venulæ copiose in areolas hexagonas anastomosantes, venulis liberis inclusis. *Sori* superficiales, inter costam et marginem 1–2-seriati. *Indusium* membranaceum, glabrum, persistens.

CHINA. Red river mountains, Mengtze, Yunnan, *Hancock*, 193.

383. **Nephrodium (Sagenia) leptophyllum,** *C. H. Wright* [Filices-Polypodiaceæ]; ad *N. singaporianum*, Baker, accedit; soris majoribus paucioribus recedit.

Frondes cæspitosæ, lanceolatæ, indivisæ, 9 poll. longæ, 1–1½ poll. latæ, tenuiter membranaceæ, glabræ, basi longe attenuatæ,

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marginibus leviter undulatis. Stipites breves, paleis brunneis angustis sparse instructi. Venæ primariæ marginem attingentes. *Sori* diffusi. *Indusia* 1 lin. diametro.

TONKIN. Laokai, *Wilson*, 24.

384. **Polypodium (Phegopteris) crinitum**, *Baker* [Filices-Polypodiaceæ]; a speciebus reliquis hujus subgeneris recedit frondibus simpliciter pinnatis, stipitibus rhachidibusque dense paleaceis.

Caudex erectus; paleæ basilares lanceolatæ, densæ, magnæ, membranaceæ, brunneæ. *Stipites* pallidi, 9–15 poll. longi, paleis lanceolatis et linearibus squarrosis membranaceis brunneis dense vestiti. *Lamina* oblongo-deltoidea, simpliciter pinnata, 12–15 poll. longa, 9–10 poll. lata, modice firma, utrinque viridis, facie glabra, dorso minute paleacea; rhachis primaria pallida, ad apicem dense paleacea; pinnæ lanceolatæ, sessiles, supra serrulatæ, ad basin in latere superiore leviter productæ, auriculatæ, inferiores 4½–5 poll. longæ, 9–10 lin. latæ; venæ liberæ, parce pinnatæ. *Sori* parvi, superficiales, globosi, inter costam et marginem 1–2-seriati.

CHINA. Yunnan: Mengtze, in mountain ravines, at 4500 ft., very rare, *Henry*, 11,557.

385. **Polypodium (Phegopteris) viscosum**, *C. H. Wright* [Filices-Polypodiaceæ]; ad *P. obscurum*, Hook., accedit; frondibus ovatis glandulosis et pinnarum lobis serratis differt.

Stipites cæspitosi, ebenacei, 4 poll. longi, paleis paucis subulatis basi instructi. *Lamina* ovata, acuminata, pinnata, 8 poll. longa, 4½ lin. lata, ad rhachin nervosque glanduloso-pilosa; pinnæ oblongæ, acuminatæ, 2½ poll. longæ, 9 lin. latæ, dilute virides, pinnatipartitæ, 2 infimæ deflexæ; lobi obtusi, obliqui, serrati; venæ simplices rarius furcatæ. *Sori* sæpius in utroque costæ latere uniseriati.

TONKIN. Laokai, *Wilson*, 36.

386. **Polypodium (Eupolypodium) convolutum**, *Baker* [Filices-Polypodiaceæ]; ad *P. achilleæfolium*, Kaulf., accedit, recedit frondibus angustioribus et lobis pinnarum ovatis obtusis.

Caudex erectus. *Stipites* capillares, cæspitosi, 1 poll. longi, paleis subulatis patulis brunneis vestiti. *Lamina* lanceolata, bipinnatifida, 3–6 poll. longa, medio 6–9 lin. lata, basin versus attenuata, membranacea, elastica, utrinque viridis, facie glabra, dorso pilosa; pinnæ contiguæ, sessiles, lanceolatæ, centrales 4–5 lin. longæ, 1½ lin. latæ, lobis ovatis obtusis; pinnæ basilares sensim minores; venæ in lobis pinnarum simplices, centrales, apicem haud attingentes. *Sori* globosi, superficiales, ad basin loborum solitarii.

CHINA. Yunnan: Ten Chen Liu Mountains, on trees, at 8000 ft., *Henry*, 10,186.

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387. **Polypodium (Eupolypodium) trichophyllum,** *Baker* [Filices-Polypodiaceæ]; ad *P. repandulum*, Mett., magis accedit; differt frondibus ubique pilosis et pinnis ad medium pinnatifidis.

Stipites brevissimi, dense cæspitosi, sordide brunnei, pilis patulis stramineo-brunneis dense vestiti. *Lamina* elastica, pendula, lanceolata, 6–9 poll. longa, medio 10–12 lin. lata, simpliciter pinnata, basin versus sensim attenuata, utrinque viridis, longe pilosa; pinnæ lineares, multijugæ, 1 lin. latæ, basi adnatæ, ad medium pinnatifidæ, lobis erecto-patentibus ovato-deltoideis obtusis; costa immersa, concolor. *Venæ* simplices, breves, erecto-patentes, perspicuæ. *Sori* globosi, superficiales, ad costas approximati, laxe dispositi.

CHINA. Yunnan: Mengtze, damp forests above the Red River at 7000 ft., on trees, *Hancock*, 153.

388. **Polypodium (Eupolypodium) simulans,** *Baker* [Filices-Polypodiaceæ]; habitus omnino *P.* (*Goniophlebium*) *microrhizomatis*, C. B. Clarke (Bedd. Fil. Brit. Ind. t. 384); differt venis liberis *Eupolypodii*.

Rhizoma gracile, repens, epigæum, paleis ovatis acutis imbricatis sordide brunneis vestitum. *Stipites* segregati, erecti, breves, straminei, nudi. *Lamina* lanceolata, simpliciter pinnata, 1 pedalis, 2–2½ poll. lata, firmula, utrinque viridis, glabra; rhachis straminea, gracilis, nuda; pinnæ lineares, 15–18 lin. longæ, 2 lin. latæ, integræ, ad basin adnatæ, infimæ haud reductæ; costa gracilis, nigra. *Venæ* erecto-patentes, perspicuæ, furcatæ, ad marginem haud productæ. *Sori* parvi, globosi, superficiales, inter costam et marginem mediales uniseriati.

CHINA. Yunnan: Mengtze, on limestone rocks, at 6000–7000 ft., *Hancock*, 152.

389. **Polypodium (Phymatodes) xiphiopteris,** *Baker* [Filices-Polypodiaceæ]; ad *P. longifolium* Mett., accedit; differt frondibus angustioribus et soris globosis superficialibus intramarginalibus.

Rhizoma gracile, late repens; paleæ basilares parvæ, lanceolatæ, membranaceæ, nigræ, clathratæ. *Stipites* brevissimi, nudi vel subnulli. *Lamina* simplex, lanceolata, 15–18 poll. longa, medio 6–8 lin. lata, acuminata, ad basin angustata, subcoriacea, rigidula, utrinque viridis, glabra; costa pallida; venæ immersæ, occultæ. *Sori* globosi, superficiales, ad marginem approximati, inter costam et marginem uniseriati.

CHINA. Yunnan: mountains to east of Mengtze, at 6000 ft., *Henry*, 11,826.

390. **Polypodium (Phymatodes) intramarginale,** *Baker* [Filices-Polypodiaceæ]; ad *P. longifolium*, Mett., accedit; differt frondibus papyraceis longe stipitatis et soris globosis minus immersis.

Rhizoma gracile, late repens, hypogæum, paleis nullis. *Stipites* graciles, pallidi, nudi, 6–8 poll. longi. *Lamina* simplex, lanceolata, papyracea, 15–18 poll. longa, medio 18–21 lin. lata, acuminata, ad basin angustata, utrinque viridis, glabra, costa pallida,

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nuda ; venæ primariæ perspicuæ, ascendentes ; areolæ intermediæ parvæ, copiosæ. *Sori* globosi, leviter immersi, ad marginem approximati, inter costam et marginem uniseriati, haud contigui.

CHINA. Yunnan : Mengtze, mountain woods, on trees, at 6000 ft., *Henry*, 10,042.

391. **Polypodium (Phymatodes) mengtzeanum**, *Baker* [Filices-Polypodiaceæ] ; inter *P. linearem*, Thunb., et *P. macrosphæram*, Baker, medium tenens.

Rhizoma gracile, repens ; paleæ basilares lanceolatæ, membranaceæ, nigræ, clathratæ. *Lamina* simplex, lanceolata, 12–18 poll. longa, medio 7–10 lin. lata, acuminata, integra, ad basin angustata, rigidula, utrinque viridis, glabra, costa pallida ; venæ immersæ, occultæ. *Sori* globosi, superficiales, remoti, inter costam et marginem uniseriati, ad marginem quam ad costam magis approximati, in dimidio superiore frondis solum enati.

CHINA. Yunnan : mountains to the east of Mengtze, at 6000 ft., *Henry*, 11,827.

392. **Polypodium (Pleuridium) micropteris**, *Baker* [Filices-Polypodiaceæ] ; ad *P. Lanceolam*, Mett., accedit ; differt frondibus papyraceis obtusis, venis primariis ad marginem haud productis et soris 1–2-seriatis.

Rhizoma gracile, repens ; paleæ basilares lanceolatæ, firmulæ, sordide brunneæ. *Stipites* 1–2 poll. longi, minute paleacei. *Lamina* simplex, oblongo-lanceolata, 2–3 poll. longa, medio 8–12 lin. lata, integra, obtusa, basi cuneata, utrinque viridis, glabra, dorso ad costam paleacea ; venæ primariæ ad marginem haud productæ ; areolæ copiosæ, venulis liberis inclusis interdum productis. *Sori* superficiales, globosi, inter costam et marginem 1–2-seriati.

CHINA. Yunnan : mountains to the east of Szemao, in shade, at 6000 ft., *Henry*, 12,630.

393. **Antrophyum petiolatum**, *Baker* [Filices-Polypodiaceæ] ; ab *A. plantagineo*, Kaulf., recedit frondibus longe petiolatis obovato-cuneatis cuspidatis.

Caudex erectus ; paleæ basilares lineares, densæ, brunneæ, membranaceæ. *Stipites* nudi, viriduli, 4–5 poll. longi. *Lamina* obovato-cuneata, cuspidata, 4–5 poll. longa, 2–2½ poll. lata, subcoriacea, utrinque viridis, glabra ; venæ verticales, interdum anastomosantes. *Sori* copiosi, in vittis verticalibus immersi.

CHINA, Yunnan : mountains to the east of Mengtze, at 6000 ft., *Henry*, 9153.

394. **Acrostichum (Polybotrya) sinense**, Baker [Filices-Polypodiaceæ] ; ab *A. appendiculato*, Willd., recedit lobis pinnarum latioribus et setis inter lobos haud productis.

Rhizoma breviter repens. *Stipites* contigui, graciles, pallidi, nudi vel obscure paleacei, frondium sterilium 6–8 poll. longi,

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frondium fertilium multo longiores. *Lamina sterilis* oblongo-lanceolata, bipinnatifida, 6-18 poll. longa, 6–8 poll. lata, membranacea, viridis, glabra, interdum ad apicem producta radicansque; pinnæ lanceolatæ, sessiles, ad medium pinnatifida, lobis oblongis obtusis 2 lin. latis; pinnæ infimæ haud reductæ; venæ liberæ, in lobis pinnarum pinnatæ, venulis ascendentibus 5–6-jugis, inferioribus furcatis. *Lamina fertilis* pinnis lineari-lanceolatis obtusis minoribus remotioribus subintegris instructa.

CHINA. Yunnan: forests of Szemao, on shaded cliffs, *Henry*, 12,494.

395. **Lycopodium (Selago) Henryi**, *Baker* [Lycopodiaceæ]; ad *L. taxifolium*, Sw., magis accedit; differt foliis oblongis acutis 1½ lin. latis.

Caules erecti, cæspitosi, graciles, straminei, semipedales, simplices vel furcati. *Folia* plana, subcoriacea, rigidula, oblongo-lanceolata, acuta, 3–4 lin. longa, 1½ lin. lata, ad apicem distincte costata, superiora vix reducta. *Sporangia* parva, straminea, ad axillas foliorum superiorum.

CHINA. Yunnan: forests of Szemao, on trees, at 5000 ft., *Henry*, 11,551.

396. **Asplenium (Anisogonium) macrodictyon**, *Baker* in Kew Bulletin, 1901, p. 144. The specific name being preoccupied (*see* Journ. of Bot., 1877, p. 163), it is proposed to substitute for it the name **A. Sanderi**, *Baker*.

II.—DIAGNOSES AFRICANÆ, XIV.

756. **Muraltia ecornuta**, *N. E. Brown* [Polygalaceæ]; affinis *M. Flanagani*, Bolus, sed gracilior et foliis angustioribus.

Rami graciles, minutissime scaberuli. *Folia* 2–3 lin. longa, ½–⅔ lin. lata, linearia, subobtusa, minute apiculata, plana, glabra. *Flores* solitarii, axillares, folia subæquantes, pedicellati, glabri, carnei. *Sepala interiora* 1 lin. longa, elliptico-oblonga, obtusa, uninervia. *Petala lateralia* 1½ lin. longa, lineari-oblonga, obtusa, basi carinæ adnata. *Carina* 1¾ lin. longa, recta, apice bilobulata, lobulis plicatis obtusis. *Capsula* 2 lin. longa, 1½ lin. lata, elliptica, obtusissima, apice incisa.

ORANGE RIVER COLONY. Manyenyeza Mountain, near Van Reenens Pass, at 6000–7000 ft., *Wood*, 5699.

757. **Hermannia longifolia**, *N. E. Brown* [Sterculiaceæ]; affinis *H. Woodii*, Schinz, sed foliis longioribus angustioribus et petalis breviter exsertis differt.

Rami procumbentes, stellato-scabridi. *Folia* petiolata, 1¼–3½ poll. longa, 4–9 lin. lata, anguste oblonga vel lineari-oblonga, apice

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subattenuata, acuta, dentata, utrinque parce stellato-scabrida; stipulæ 2–3 lin. longæ, lanceolatæ, acutæ. *Pedunculi* axillares, 2–2½ poll. longi, stellato-scabridi, biflori; bracteæ 2½–3 lin. longæ, lineari-subulatæ; pedicelli 1½–7 lin. longi. *Calyx* campanulatus, 4–5 lin. longus, ad medium 5-dentatus, stellato-subtomentosus, vix scabridus, dentibus deltoideis acutis. *Petala* 5–5½ lin. longa, 2¼–2½ lin. lata, basi cymbiformia, utrinque pubescentia, superne elliptico-oblonga, extra glabra, intus papillosa, lutea. *Stamina* inclusa; filamenta supra medium transversim tuberculata, tuberculis villoso-pubescentibus. *Ovarium* obovoideum, 5-sulcatum, pubescens; stylus glaber.

NATAL. Near Wessels Nek, at 3700 ft., *Wood*, 5701.

758. **Celastrus concinnus**, *N. E. Brown* [Celastraceæ]; affinis *C. nemoroso*, Eckl. et Zeyh., a qua foliis minoribus et pedunculis capillaribus facile distinguitur.

Frutex omnino glaber, spinosus. *Rami* angulares, spinis rectis 1–1½ poll. longis armati. *Folia* rotundata, ovata vel lanceolata, obtusa, serrulata, petiolo 1–2 lin. longo, lamina ½–1½ poll. longa, ¼–poll. lata. *Cymæ* 1–3, axillares, parvæ, 2–3-floræ, pedunculis capillaribus 2½–7 lin. longis; bracteæ minutæ; pedicelli 1–1½ lin. longi. *Sepala* orbiculata, obtusa, ⅓ lin. diam., minute ciliata. *Petala* ¾ lin. longa, ¾ lin. lata, elliptica, obtusa, minutissime et irregulariter denticulata, alba. *Ovarium* 3-loculare, loculis 2-ovulatis; stylus ¼ lin. longus; stigmata ¼ lin. longa, linearia, recurva.

NATAL. Edge of a wood near Lidgetton, at 3000–4000 ft., *Wood*, 6336; Inanda, *Wood*, 1395.

759. **Celastrus albatus**, *N. E. Brown* [Celastraceæ]; species distinctissima, foliis subtus albis.

Rami primum albidi, demum cinerei, glabri. *Folia* 1½–2 poll. longa, 7–17 lin. lata, elliptica vel ovata, obtusa vel acuta, denticulata, breviter petiolata, supra viridia, subtus albata, glabra. *Flores* ad axillas fasciculati; pedicelli 2½–3 lin. longi, infra medium articulati, graciles, glabri. *Sepala* ½ lin. longa, late ovata vel rotundata, acuta vel obtusa, ciliato-denticulata. *Petala* 1¼ lin. longa, 1 lin. lata, elliptica, obtusa, margine crispata, lutea. *Ovarium* glabrum, 3-loculare, loculis 2-ovulatis; stylus vix ¼ lin. longus; stigmata minuta.

NATAL. At the edge of a wood near Van Reenens Pass, at 5000–6000 ft., *Wood*, 6362.

760. **Pterocelastrus echinatus**, *N. E. Brown* [Celastraceæ]; affinis *P. stenoptero*, Walp., sed pedunculis longioribus et fructibus magis echinatis differt.

Frutex omnino glaber. *Folia* alterna, brevissime petiolata, ¾–2 poll. longa, 4–11 lin. lata, lanceolata vel oblongo-obovata, apice obtusa vel leviter emarginata, basi cuneato-acuta. *Cymæ* parvæ,

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axillares (immaturas tantum vidi), pedunculis 2–3 lin. longis. *Fructus* 3 lin. longus, 2½–3 lin. diam., ellipsoideus vel globosus, grosse echinatus.

NATAL. Province of Zululand; 'Nkandhla, *Haygarth in Herb. Wood.*, 7538.

761. **Rhus cuneata**, *N. E. Brown* [Anacardiaceæ-Anacardieæ]; affinis *R. crenatæ*, Thunb., sed foliis subtus eglandulosis facile distinguitur.

Frutex ramosus, ramis pubescentibus cinereis. *Folia* petiolata, 3-foliolata; foliola elongato-cuneato-obovata, apice obtusa tridentata vel emarginata, basi anguste cuneata, glabra, subtus pallidiora, eglandulosa; intermedium ½–1¼ poll. longum 2½–6 lin. latum; lateralia quam intermedium breviora sed subæquilata; petiolus 2–7 lin. longus, pubescens, canaliculatus vel angustissime alatus. *Paniculæ* (immaturas tantum vidi) 1–3 poll. longæ, terminales, multifloræ, subfloccoso-pubescentes.

NATAL. On a rocky hill near Ladysmith, at 3300 ft. *Wood*, 5706.

762. **Pyrenacantha ? kamassana**, *Baill.* in *Adansonia*, x. 272 [Olacineæ]. Adde:—(descriptionem imperfectam amplificavit *C. H. Wright*).

Folia quinquelobata, basi cordata, velutina, sparse dentata, 1¼ poll. longa, 1½–2 poll. lata; petiolus 1 poll. longus, dense appresseque hirsutus. *Spica* mascula 1 poll. longa, densiflora, axillaris vel supra-axillaris; pedunculus 2 poll. longus, appresse hirsutus. *Perianthium* 1 lin. diam.; lobi breviter triangulares, extus hirsuti. *Filamenta* complanata; antheræ filamentis æquilongæ.

RHODESIA. Boruma, *Menyharth*, 819.

763. **Lotononis Haygarthii**, *N. E. Brown* [Leguminosæ–Genisteæ]; affinis *L. sessilifoliæ*, Harv., foliis petiolatis tenuiter appresse villosis et floribus majoribus differt.

Planta perennis basi lignosa. *Caules* erecti, apicem versus tantum 1–2-ramosi, appresse villosi, usque ad apicem dense foliosi. *Folia* petiolata, trifoliolata, erecta; petiolus 1–2 lin. longus; foliola 6–11 lin. longa, 1¼–2½ lin. lata, anguste cuneato-oblanceolata, apice mucronata, basi acuta, utrinque parce appresse villosa. *Racemus* terminalis, subsessilis, erectus, 1–1¼ poll. longus, 9–10 lin. diam., densus; bracteæ 1½–2 lin. longæ, lanceolatæ, acutæ, appresse pubescentes; pedicelli 1–1¼ lin. longi, appresse pubescentes, apice bibracteolati; bracteolæ 1¼–1½ lin. longæ, subulatæ, acutæ. *Calyx* 3-3¼ lin. longus, campanulatus, appresse pubescens, dentibus lateralibus 1¼ lin. longis usque ad ⅔ connatis. *Corolla* lutea; vexillum 5½–6 lin. longum, 3½ lin. latum, orbiculatum, obtusum, unguiculatum, rectum, marginibus reflexis, dorso pubescens; alæ 6 lin. longæ, 2 lin. latæ, spathulato-obovatæ,

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obtusæ, longe unguiculatæ, concavæ vel subcomplicatæ, glabræ; carina 5 lin. longa, stricta, obtusa, glabra. *Ovarium* dense sericeum; stylus glaber, rectus.

NATAL. Province of Zululand: Nkandhla, *Haygarth in Herb. Wood.*, 7460.

764. **Lotononis adpressa,** *N. E. Brown* [Leguminosæ-Genisteæ]; similis *L. molli*, Benth., a qua foliolis lanceolato-oblongis et calyce angustiore differt.

Planta perennis, multiramosa, ramis prostratis 2–6 poll. longis basi lignosis pubescentibus. *Folia* petiolata, trifoliolata, molliter sericeo-tomentosa; petiolus 1½–2½ lin. longus; foliola 1½–3 lin. longa, ¾–1¼ lin. lata, subæqualia oblongo-lanceolata, acuta; stipulæ solitariæ, 1½–2½ lin. longæ, ⅔–1 lin. latæ, oblongo-lanceolatæ, breviter petiolulatæ. *Flores* axillares, solitarii, brevissime pedicellati. *Calyx* anguste campanulatus, infra medium dentatus, appresse pubescens, dentibus subulato-acuminatis. *Corolla* 4 lin. longa, lutea, appresse pubescens; vexillum ellipticum, acutum, unguiculatum; alæ oblongæ, obtusæ, basi semihastatæ, unguiculatæ; carina obtusa. *Ovarium* 5-ovulatum; stylus glaber.

NATAL. On a stony hill near Charlestown, at 5000–6000 ft., *Wood*, 5712.

765. **Argyrolobium reflexum,** *N. E. Brown* [Leguminosæ-Genisteæ]; species affinis *A. polyphyllo*, Eckl. and Zeyh., sed gracilior, floribus minoribus et calyce multo breviore.

Fruticulus erectus, ramosus, ramis gracilibus strictis ascendentibus minute appresso-pubescentibus. *Folia* petiolata, trifoliolata, exstipulata; petiolus 1½–2 lin. longus, appresse pubescens; foliola 2–5½ lin. longa, 1–1½ lin. lata, cuneato-oblonga, obtusa, subapiculata, basi acuta, supra glabra, subtus tenuiter appresse pubescentia. *Racemi* terminales, 2–3-flori, 4–6 lin. longi, appresse pubescentes; bracteæ ¾–1 lin. longæ, subulatæ; pedicelli 1–1½ lin. longi. *Calyx* 2 lin. longus, ad medium bilabiatus, tenuiter appresse pubescens, labio superiore acute bidentato, labio inferiore acute tridentato. *Corolla* lutea, linea in vexilli facie externa excepta glabra; vexillum 4 lin. longum, abrupte reflexum subrotundatum, obtusissimum, complicatum, unguiculatum; alæ 3½ lin. longæ, oblongæ, obtusæ, basi auriculatæ, unguiculatæ; carina 4½ lin. longa, obtusa, glabra *Legumen* lineare, 9 lin. vel ultra longum, compressum, glabrum, dorso ciliatum.

NATAL. Province of Zululand; Ungoya, at 1000–2000 ft., *Wylie in Herb. Wood.*, 5688.

766. **Argyrolobium variopile,** *N. E. Brown* [Leguminosæ-Genisteæ]; species affinis *A. longipedi*, N. E. Brown, a qua indumento et foliis longe petiolatis facile distinguitur.

Herba perennis, ramis gracilibus decumbentibus, pilis diffusis minutissimis appressis et pilis longis patentissimis paucis obtectis. *Folia* petiolata, trifoliolata; petiolus 2–10 lin. longus, filiformis; foliola 3–6 lin. longa, 1½–3½ lin. lata, obovata, obtusa,

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sessilia, supra glabra, subtus pilis minutis vel elongatis et appressis vel longis patentibusque parce obtecta; stipulæ 1–4 lin. longæ, ½–2 lin. latæ, ovatæ vel oblongo-lanceolatæ, acutæ. *Pedunculi* foliis oppositi, 1–2-flori, graciles, ½–2½ poll. longi, pilis variis parce obtecti; bracteæ minutæ, subulatæ, appressæ. *Calyx* 3 lin. longus, pilis variis parce obtectus; tubus brevissimus, ¾ lin. longus; lobi lanceolati, acuminati, duo superiores fere liberi, tres inferiores usque ad medium connati. *Corolla* lutea; vexillum 4 lin. longum et latum, orbiculato-reniforme, apice parce pubescens; alæ 3 lin. longæ, oblongæ, obtusæ, basi auriculatæ, unguiculatæ, glabræ; carina 3½ lin. longa, obtusa, glabra. *Legumen* ¾–1 poll. longum, 1¼ lin. latum, lineare, villosum.

NATAL. On a hill side near Charlestown, at 5000–6000 ft. *Wood*, 5693, 6355.

767. **Indigofera longipes**, *N. E. Brown* [Leguminosæ-Galegeæ]; affinis *I. fastigiatæ*, E. Meyer, a qua calyce minore et corolla pubescente facile distinguitur.

Caules erecti, simplices, 1½–2 ped. alti, graciles, leviter angulati, appresse canescenti-strigosi. *Folia* 1–1½ poll. longa, imparipinnata; foliola 3–4-juga, opposita, 4–9 lin. longa, ½–⅔ lin. lata, linearia, acuta, complicata, utrinque appresse strigosa; stipulæ ¾–1 lin. longæ, setiformes. *Racemi* longe et graciliter pedunculati, usque ad 7 poll. longi; bracteæ caducæ, 1 lin. longæ; pedicelli 1½ lin. longi, capillares. *Calyx* 1¼ lin. longus, infra medium 5-dentatus, appresse canescente-strigosus, dentibus subulatis. *Corolla* alba; vexillum 2¼ lin. longum et latum, orbiculare, obtusum, sessile, dorso brunneo-pubescens; alæ 2¼ lin. longæ, 1 lin. latæ, oblongo-obovatæ, subfalcatæ, obtusæ, pubescentes, ciliatæ; carina 2¼ lin. longa, obtusa, pubescens, ciliata, utrinque ad medium acute calcarata. *Ovarium* glabrum.

NATAL. On a stony hill near Ladysmith, at 3400 ft., *Wood*, 5727.

768. **Crassula Barklyi**, *N. E. Brown* [Crassulaceæ]; affinis *C. columnari*, Linn. f., sed minor, et foliis tenuioribus ciliatis suberectis, etiam differt.

Planta ½–1 poll. alta, pyramidalis. *Caulis* simplex vel basi ramosus, foliis dense obtectus. *Folia* adscendentia, arcte imbricata, decussata, 2–2½ lin. longa, 4–6 lin. lata, lunata, amplexicaulia, obtusissima, glauca, margine tenui acuta ciliata. *Flores* terminales, capitulati, subsessiles. *Sepala* 1⅓–1½ lin. longa, ⅓–½ lin. lata, lineari-spathulata, obtusa, glabra, ciliolata. *Corolla* gamopetala, 5-lobata, tubus 1 lin. longus; lobi 2½ lin. longi, ½ lin. lati, lineares, obtusi, crassuli, dorso leviter carinati, erecti, glabri. *Stamina* 5 ore tubi inserta; filamenta ½ lin. longa; antheræ ½ lin. longæ, oblongæ. *Squamæ hypogynæ* ½ lin. longæ, erectæ, linearicuneatæ, truncatæ, intra canaliculatæ. *Carpella* 5, basi connata, erecta, stricta, subteretia superne vix angustata.

CAPE COLONY. Little Namaqualand, *Sir H. Barkly*.

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769. **Crassula sedifolia**, *N. E. Brown* [Crassulaceæ]; affinis *C. Cooperi*, Regel, sed glabra; etiam foliis tereto-subclavatis nec supra planis differt.

Planta herbacea, 1½–2¼ poll. alta. *Caules* e basi plures, glabri, erecti, ad nodos leviter constricti. *Folia* radicalia conferta, 5–6 lin. longa, 1¼–1½ lin. crassa, tereto-subclavata, acuta, carnosa, glabra, obscure impresso-maculata, lineis duabus papillarum cartilaginearum subciliata; folia caulina 3–6 lin. distantia, sessilia nec connata, 1½–2½ lin. longa, turgida, acuta. *Cymæ* terminales, 2–10-floræ, laxæ. *Pedicelli* 2½–5 lin. longi, glabri. *Sepala* ½–¾ lin. longa, oblonga, subacuta, glabra. *Petala* 5, alba, 2 lin. longa, ¾ lin. lata, oblonga, obtusa, plana, dorso apice minute apiculata. *Antheræ* luteæ.

SOUTH AFRICA. Precise locality unknown.

Described from living plants flowering at Kew in August, 1900, which were received from Prof. MacOwan in 1899.

770. **Begonia calabarica**, *Stapf* [Begoniaceæ]; affinis *B. quadrialatæ*, Warb., sed foliis basi cordatis latioribus, ovario breviore latioreque nec non et petiolis et pedunculis et stylis brevioribus diversa.

Herba subacaulis. *Caulis* brevis, prostratus, saturate viridis, circa squamarum vel foliorum bases pilosus, cæterum glaber. *Foliorum* petioli 1½–2 poll. longi, patule hirsuto-villosi; laminæ peltatæ, oblique lateque cordato-ovatæ, acutæ vel obtusæ, 2–3 poll. longæ latæque, obscure sinuato-dentatæ, præter margines rubescentes ciliato-fimbriatos subundulatos læte virides, supra glaberrimæ, infra primo in nervis molliter hirsutæ, deinde glabratæ, nervis 6–8 furcatis radiantibus, umbone a sinu 3–4 lin. distante. *Pedunculus* petiolis similis, circiter 1 poll. longus, pauciflorus. *Flores* terminales, umbellati, 2 masculi pedicellati, 1 femineus subsessilis; bracteæ oblongæ, ad 2 lin. longæ, integræ, vel sursum fimbriato-dentatæ. *Flores* ♂: pedicelli ad 6–7 lin. longi, parce pilosi; sepala 2, elliptico-rotundata, subaequalia, 5–6 lin. longa, extus parce pilosa, superum extus rubrum, intus basi rubrum, cæterum aureum, inferum utrinque flavum; petala o; staminum filamenta basi in columnam brevem connata, parte libera antheris 1 lin. longis subemarginatis paullo breviore, *Flos* ♀: pedicelli subnulli; sepala ut in ♂, sed paullo minora; petala o; styli 4, basi breviter connati, 1 lin. longi; stigmata reniformia, papillarum serie continua, 1 lin. vel paullo ultra lata; ovarium sub anthesi viride, 7 lin. longum, ad 6 lin. latum, 4-alatum, alis rotundatis superne ad 2½ lin. longis, inferne paullo angustioribus.

WEST TROPICAL AFRICA. Calabar.

Described from a plant in cultivation at Kew.

771. **Felicia Burchellii**, *N. E. Brown* [Compositæ-Asteroideæ]; affinis *F. petiolatæ*, N. E. Brown (*Asteri petiolato*, Harv.), sed foliis oppositis integris differt.

Herba perennis, suffruticosa (?). *Caules* decumbentes, ramosi, parce pubescentes. *Folia* opposita, petiolata, elliptica vel elliptico-

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ovata, integra, utrinque obtusa, apice minute apiculata, supra glabra, subtus parce appresse pubescentia; petiolus 1½–3 lin. longus; lamina 3–10 lin. longa, 2–5 lin. lata. *Pedunculi* solitarii, terminales, 1–6 poll. longi, appresse puberuli. *Involucri* campanulati bracteæ biseriatæ, discum fere æquantes, 2½ lin. longæ, ½ lin. latæ, lineares, acutæ, pubescentes, apice ciliatæ. *Corollæ* radii 3½–4 lin. longæ, fere 1 lin. latæ, ligulatæ, subacutæ; corollæ disci 2¼ lin. longæ, tubulosæ, 5-dentatæ, glabræ. *Ovarium* tenuiter puberulum; pappi setæ scabridæ, albæ.

SOUTH AFRICA. Alexandria Division: on the rocks in Zwartwater Poort, *Burchell*, 3360, 3371.

772. **Vernonia scabrida**, *C. H. Wright* [Compositæ-Vernoniaceæ]; *V. Melleri*, Oliv. et Hiern, accedit, foliorum tomento et bractearum forma differt.

Caulis suffrutescens, leviter sulcatus, hispidus. *Folia* linearilanceolata, acuminata, supra scabro-pubescentia, subtus hispidotomentosa, 5 poll. longa, 5 lin. lata, marginibus revolutis. *Capitula* 1 poll. diam., corymbosim disposita. *Bracteæ* oblongæ, acuminatæ, mucronatæ, extus prope apicem rubido-tinctæ pilosæque, intus nitidæ. *Corolla* rubido-purpurea, 5 lin. longa. *Achænia* appresse hirsuta. *Pappus* stramineus; series exterior brevis; series interior 3–4 lin. longa, scabrida.

BRITISH CENTRAL AFRICA. Nyasaland: Namasi, *Cameron*, 41.

773. **Helichrysum Woodii**, *N. E. Brown* [Compositæ-Inuloideæ]; affine *N. Sutherlandi*, Harv., foliis lanatis et involucri squamis luteo-albidis basi viridi-vittatis facile distinguitur.

Fruticulus ramosus, basi lignosus. *Rami* basi dense superne laxe foliosi, dense lanati. *Folia* petiolata, orbiculata vel obovata, obtusissima, utrinque lanata, supra subviridia, subtus alba, trinervia; petiolus 1–2 lin. longus; lamina ½–1 poll. longa, 4–9 lin. lata. *Capitula* parva, 2 lin. longa et lata, 14–18-flora, dense cymoso-corymbosa. *Involucri* campanulati squamæ 4–5-seriatæ; interiores 1¾ lin. longæ, ¼–½ lin. latæ, lineari-oblongæ, obtusissimæ, apice luteo-albidæ, radiantes, inferne viridi-vittatæ, glabræ; exteriores minores, appressæ, lanatæ. *Receptaculum* parvum, nudum. *Corolla* 1½ lin. longa, tubulosa, basi inflata, superne infundibuliformis, acute 5-dentata, glabra, lutea. *Pappi* setæ scabridæ, deciduæ. *Achænia* vix compressa, oblonga, pallida, vix scaberula, fere lævia, nec angulata.

NATAL. On rocks near Emberton, at 2100 ft., *Wood*, 5761.

774. **Helichrysum Sutherlandi**, *Harv.*, var. **semiglabrum**, *N. E. Brown* [Compositæ-Inuloideæ]; folia supra glabra, subtus albo-tomentosa.

NATAL. On the Drakensberg Range, near Van Reenens Pass, alt. 5000–6000 ft., *Wood*, 5702.

The facies of this variety is rather different from that of the type, but I can find no character to distinguish it beyond the glabrous upper surface of the leaves.

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775. **Helichrysum Galpinii**, *N. E. Brown* [Compositæ-Inuloideæ]; species insignis ab omnibus distinctissima.

Fruticulus robustus, depressus, ramosissimus, lignosus, ramis prostratis, 2–5 lin. crassis, ramulis brevibus foliis senescentibus dense obtectis. *Folia* parva, ad apices ramulorum densissime conferta, rosulata, demum deflexa, 2–4 lin. longa, $\frac{1}{3}$–$\frac{1}{2}$ lin. lata, linearia, obtusa, lana alba utrinque dense vestita. *Capitula* parva, $1\frac{1}{2}$ lin. longa, $1\frac{1}{4}$–$1\frac{1}{2}$ lin. diam., 18–20-flora, in capitulum globosum pedunculatum $\frac{1}{3}$–$\frac{1}{2}$ poll. diam. conferta. *Pedunculus* terminalis, 2–7 lin. longus, bracteatus, lana alba vestitus. *Involucri* campanulati squamæ 3–4-seriatæ; exteriores albo-lanatæ; interiores $1\frac{1}{2}$ lin. longæ, $\frac{1}{4}$ lin. latæ, lineares, obtusæ, apice scariosæ, pallide brunnæ, undulatæ, intra supra medium purpureo-notatæ. *Receptaculum* parvum, nudum. *Corollæ* $1\frac{1}{4}$–$1\frac{1}{3}$ lin. longæ, tubulosæ, apice breviter et acute 5-dentatæ, glabræ. *Pappi* setæ apice clavulato-barbellatæ, albæ. *Ovarium* glabrum.

TRANSVAAL. On rocks, on the summit of Saddleback Mountain, near Barberton, alt. 5000 ft., flowering in September, *Galpin*, 544.

A very singular and well marked species, which has the appearance of being a stout, woody shrub, its much divided branches spreading on or close to the ground, and the crowded tips ending in small dense tufts of white-felted leaves.

776. **Senecio vitalis**, *N. E. Brown* [Compositæ-Senecioniдeæ]; affinis *S. corymbifero*, DC., sed foliis acutioribus et capitulis minoribus differt.

Planta fruticosa, succulenta. *Caules* erecti, $2\frac{1}{2}$–5 lin. crassi, glabri, glauci. *Folia* subconferta, suberecta, sessilia, $1\frac{1}{4}$–3 poll. longa, $1\frac{1}{2}$–2 lin. crassa, subcylindrico-fusiformia, acutissima, basi angustata, glauca. *Pedunculi* terminales corymboso-conferti, 1–3 poll. longi, laxe corymboso-ramosi, nudi, glabri. *Capitula* $3\frac{1}{2}$–4 lin. longa, $2\frac{1}{2}$–3 lin. diam., 10–13-flora, discoidea. *Involucrum* campanulatum, vix calyculatum; bracteæ 6–8, lineares, acuminatæ, glabræ, 3–$3\frac{1}{2}$ lin. longæ, $\frac{1}{2}$ lin. latæ. *Corolla* $2\frac{1}{4}$ lin. longa, tubulosa, breviter 5-dentata, glabra. *Achænia* $1\frac{1}{2}$ lin. longa, linearia, glabra. *Pappi* setæ copiosæ, $2\frac{1}{4}$–$2\frac{3}{4}$ poll. longæ, albæ.

CAPE COLONY. East London Division: Krantz near the mouth of Kahoon River, *Galpin*, 5669. Alexandria Division: on the rocks of Zwartwater Poort, *Burchell*, 3408. Also cultivated specimens.

777. **Euryops setiloba**, *N. E. Brown* [Compositæ-Senecioniдeæ]; species ab aliis distinctissima.

Herba perennis, caulibus cæspitosis $1\frac{1}{2}$–3 poll. longis erectis prope apicem 1–2-ramosis dense foliosis. *Folia* 4–7 lin. longa, $1\frac{1}{2}$–$2\frac{1}{2}$ lin. lata, erecta, imbricata, profunde spinuloso-pinnatisecta, rigida, dorso striata, glabra, in axillis laxe arachnoidea, lobis utrinque 4–6 spinuliformibus rigidis $\frac{1}{2}$–$1\frac{1}{2}$ lin. longis subpatentibus.

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Pedunculi solitarii, laterales, 4–7 poll. longi, graciles, estriati, glabri. *Capitulum* hemisphæricum, multiflorum, radiatum, luteum. *Involucri* squamæ 10–14, lanceolatæ, acutæ vel acuminatæ, basi connatæ, glabræ, ciliatæ. *Corollæ radii* 2½ lin. longæ, ¾–1 lin. latæ, oblongæ, obtusæ, apice minute trifidæ, glabræ. *Corollæ disci* 1–1¼ lin. longæ, ½ lin. diam., basi brevissime tubulosæ, superne campanulatæ, apice breviter 5-dentatæ, glabræ. *Pappi* setæ intermixtæ, caducæ. *Ovarium* glabrum.

NATAL. On a grassy hill near Nottingham Road Station, at 4000–5000 ft., *Wood*, 7193.

778. **Euryops striata**, *N. E. Brown* [Compositæ-Senecionideæ]; *E. setilobæ*, N. E. Brown, similis sed caulibus demum multo longioribus, pedunculis distincte striatis et corollis radii multo longioribus facile distinguitur.

Herba perennis. *Caules* cæspitosi, erecti, simplices sub anthesi 1–1½ poll. longi, demum 4–7 poll. longi, dense foliosi. *Folia* 3–4 lin. longa, 2 lin. lata, erecta, imbricata, profunde spinuloso-pinnatisecta, glabra, lobis utrinque 3–5 spinuliformibus rigidis subpatentibus. *Pedunculi* solitarii, laterales, 4–7 poll. longi, graciles, distincte striati, glabri. *Capitulum* hemisphæricum, radiatum, multiflorum, luteum. *Involucri* squamæ 10–13, lanceolatæ, acuminatæ, basi connatæ, glabræ. *Corollæ radii* 4½ lin. longæ, ¾–1 lin. latæ, revolutæ, lineari-oblongæ, obtusæ, apice minute trifidæ, glabræ. *Corollæ disci* 1½ lin. longæ, ¾ lin. latæ, basi anguste tubulosæ, superne campanulatæ, breviter 5-dentatæ, glabræ. *Pappi* setæ paucæ, caducissimæ. *Ovarium* glabrum.

TRANSVAAL. Summit of Saddleback Mountain near Barberton, at 5000 ft., *Galpin*, 988.

This species is very closely allied to *E. setiloba*, N. E. Brown, but the stems become more elongated, the peduncles are very distinctly striate, and the ligulate florets are nearly twice as long as those of *E. setiloba*, whilst the leaves are not striate in the same way beneath, and their spine-like lobes are rather more slender. These two species are very distinct from any others in the genus.

779. **Gnidia mollis**, *C. H. Wright* [Thymelæaceæ]; *G. denudatam*, Lindl., simulans, sed floribus in capitula densa terminalia dispositis differt.

Caulis lignosus, pilosus. *Folia* elliptica, acuta vel obtusa, plus minusve conferta, supra puberula, subtus dense appresseque pilosa, 6 lin. longa, 1–2 lin. lata. *Capitula* multiflora; bracteæ late lanceolatæ, extus pilosæ. *Perianthii* tubus tenuis, extus nisi prope basin pilosus, basi pilis hypogynis elongatis inclusus; lobi ovati, obtusi; squamæ subulatæ. *Stamina* 8. *Ovarium* oblongum; stylus subapicalis.

CENTRAL AFRICA. German East Africa: lower plateau, north of Lake Nyasa, *Joseph Thomson*. Portuguese East Africa: between Unangu and Lake Shiré, *W. P. Johnson*, 12.

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780. **Moræa monophylla**, *Baker* [Iridaceæ]; a *M. tenui*, Ker-Gawl., recedit caule monocephalo, flore majore et segmentis interioribus integris.

Cormus globosus, parvus, tunicis exterioribus in fibras dissolutis. *Folium* perfectum unicum, setaceum, patulum, prope basin pedunculi ortum. *Caulis* simplex, flexuosus, gracillimus, monocephalus, 6–9 poll. longus, foliis reductis 2 vaginatis superpositis. *Spathæ* cylindricæ, 6–9 lin. longæ, firmæ, rigidulæ, exterior quam interior multo brevior. *Ovarium* clavatum, 3 lin. longum. *Perianthium* lilacinum, tubo nullo, segmentis exterioribus oblongo-cuneatis 9 lin. longis, carina infra pilosa, segmentis interioribus minutis integris linearibus vel oblongo-lanceolatis. *Styli* angusti, limbo duplo breviores, cristis lanceolatis.

CAPE COLONY. Clanwilliam Division : Olifant's river, *Penther* 626, 685.

781. **Moræa diphylla**, *Baker* [Iridaceæ]; a *M. natalense*, Baker, recedit foliis ad basin inflorescentiæ productis geminis.

Cormus globosus, parvus, tunicis pallide brunneis, squamis exterioribus lanceolatis. *Pedunculus* gracillimus, 4–6 poll. longus, foliis 2 elongatis setaceis recurvatis ad basin inflorescentiæ instructus. *Spathæ* 1–3, cylindricæ, breviter pedunculatæ, 12–15 lin. longæ, valvæ rigidæ pallide virides, exterior quam interior multo brevior. *Ovarium* cylindricum. *Perianthium* luteum, fugax, 6–9 lin. longum, segmentis exterioribus oblongo-cuneatis 2 lin. latis, interioribus oblanceolatis. *Antheræ* 2 lin. longæ, filamentis æquilongæ.

CAPE COLONY. Clanwilliam Division : Olifants river, *Penther*, 734.

782. **Moræa fusca**, *Baker* [Iridaceæ]; a *M. ramosa*, Ker-Gawl. differt foliis setaceis, spathis longioribus et floribus fuscis.

Cormus globosus, parvus, tunicis brunneis fibrosis. *Caulis* gracilis, teres, ramosus, sesquipedalis, foliis perfectis 1–2 setaceis elongatis, spathis 3–6 terminalibus præditus. *Spathæ* cylindricæ, 1½–2 poll. longæ, firmæ, viridulæ, exterior quam interiores multo brevior. *Limbus* fuscus, pollicaris, segmentis exterioribus obovato-cuneatis 4 lin. latis, interioribus oblanceolatis. *Ovarium* clavatum, 4 lin. longum. *Styli* rami limbo duplo breviores, cristis lanceolatis.

CAPE COLONY. Caledon, *Penther*, 762.

783. **Romulea torta**, *Baker* [Iridaceæ]; ad *R. hirsutam*, Eckl., accedit; differt foliis glabris spiraliter tortis.

Cormus parvus, globosus, tunicis duris brunneis apice breviter setosis. *Folia* basalia 2–3, lineari-subulata, glabra, 2–3 poll. longa, erecta, conspicue spiraliter torta. *Pedunculus* brevis, gracilis, simplex vel furcatus, 1–2-florus. *Spathæ* lanceolatæ, pallide virides, 4–6 lin. longæ. *Perianthium* 9 lin. longum, tubo brevi

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infra cylindrico aurantiaco, segmentis oblanceolato-oblongis, basi aurantiacis supra basin nigrescentibus sursum rubro-purpureis, striis dorsalibus haud plumosis. *Stamina* brevia. *Stylus* ex antheris eminens.

CAPE COLONY. Clanwilliam Division : Olifants river, *Penther*, 624, 687.

784. **Romulea rubrolutea**, *Baker* [Iridaceæ] ; ad *R. roseam*, Eckl., accedit ; differt foliis setaceis, floribus pluribus fundo aurantiacis.

Cormus globosus, 4–6 lin. diam., tunicis brunneis rigidis apice breviter fibrosis. *Folia* basalia setacea, recurvata, plurima 6–9 poll. longa. *Pedunculus* brevis, furcatus. *Flores* plurima, corymbosi ; spathæ subæquales, lanceolatæ, 6–7 lin. longæ, pallide virides, rigidulæ. *Perianthium* 10–12 lin. longum, tubo brevi infundibulari aurantiaco, limbi segmentis oblanceolato oblongis basi aurantiacis, sursum rubro-purpureis, infra nigrescentibus, striis tribus dorsalibus saturatioribus haud plumosis. *Stamina* brevia. *Stylus* ex antheris eminens.

CAPE COLONY. Clanwilliam Division : Olifants river, *Penther*, 678 ; Piquetberg, *Penther*, 633.

785. **Aristea cuspidata**, *Schinz* [Iridaceæ] ; ad *A. racemosam*, Baker, accedit ; differt foliis planis linearibus, pedunculo compresso angulato, floribus majoribus.

Folia basalia 5–6, linearia, rigidula, erecta, 6–12 poll. longa. *Pedunculus* semipedalis vel pedalis, compressus, obscure angulatus, foliis pluribus reductis vaginatus. *Inflorescentia* simplex, laxa, 3–5 poll. longa ; spathæ omnes sessiles vel infima pedunculata, exteriore oblonga 4–6 lin. longa, interioræ haud lacerates. *Perianthium* violaceum, 6 lin. longum, segmentis oblongis, *Stamina* perianthio distincte breviora. *Ovarium* lineari-oblongum, acute angulatum.

CAPE COLONY. Caledon Division : Leos Kraal, *Penther*, 555.

786. **Aristea parviflora**. *Baker* [Iridaceæ] ; ad *A. flexicaulem*, Baker, accedit ; differt floribus spathis minoribus, paniculæ axi haud flexuosa.

Folia basalia plurima, linearia, recurvata, subcoriacea, 6–8 poll. longa. *Pedunculus* teres, gracilis, subpedalis, foliis plurimis reductis vaginatus. *Panicula* rhomboidea, 3–4 poll. longa, ramis ascendentibus ; spathæ ad ramos inferiores 3–4, sessiles vel infima pedunculata, ovatæ 2 lin. longæ, interioræ haud lacerates. *Perianthium* violaceum, 2 lin. longum, segmentis oblongis. *Stamina* perianthio distincte breviora. *Ovarium* globosum, obtuse angulatum.

CAPE COLONY. Griqualand East : Insizwa Mountains, *Krook in Herb. Penther.*, 556.

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787. **Geissorhiza violacea**, *Baker* [Iridaceæ]; ad *G. Bolusii*, Baker, magis accedit; differt foliis paucioribus longioribus, flore saturate violacea segmentis longioribus.

Cormus ignotus. *Folia* basalia 2–3, erecta, linearia, glabra, 4–8 poll. longa. *Pedunculus* gracilis, teres, pedalis, furcatus, foliis 2 reductis præditus. *Spicæ* laxæ, 3–7-floræ; spathæ valvæ oblongæ, obtusæ, virides, 3–4 lin. longæ. *Perianthium* saturate violaceum, 9 lin. longum, segmentis oblanceolatis obtusis tubo cylindrico longioribus. *Stamina* limbo paullo breviora, antheris linearibus. *Stylus* ex tubo breviter protrusus.

CAPE COLONY. Knysna Division: Blaauw krantz Fontein, *Penther*, 677.

788. **Geissorhiza parva**, *Baker* [Iridaceæ]; ad *G. rupestrem*, Schlechter, proxima; differt spathæ valva exteriore orbiculari.

Cormus parvus, globosus, tunicis exterioribus rigidis brunneis. *Caulis* gracillimus, 1½–2 poll. longus, foliis 3 linearibus 3–8 lin. longis præditus, superiori prope medium caulis imposito. *Spica* 3–4-flora, axi flexuosa; spatha exterior orbiculari-complicata, 2 lin. longa, ad apicem firma, viridis brunneo tincta. *Perianthii* tubus cylindricus, spathæ æquilongus vel breviter exsertus; limbus concolor, pallide luteus, segmentis oblanceolato-oblongis. *Antheræ* lineares, 1½ lin. longæ, filamentis æquilongæ. *Stylus* ex tubo breviter exsertus.

CAPE COLONY. Caledon Division: Houw Hoek, *Penther*, 723.

789. **Geissorhiza inconspicua**, *Baker* [Iridaceæ]; ad *G. humilem*, Ker-Gawl., accedit; differt foliis brevioribus, limbo minor, perianthii tubo quam limbus æquilongo.

Cormus ignotus. *Folia* basalia 3, linearia, glabra, 1½–2 poll. longa. *Pedunculus* gracilis, 3–4 poll. longus, folio reducto unico prope medium præditus. *Spica* laxa, simplex, 4–5-flora; spathæ valvæ oblongæ, obtusæ, virides, margine membranaceæ, 3 lin. longæ. *Perianthii* tubus cylindricus, spathæ æquilongus; limbus, 3 lin. longus, pallide luteus vel rubro tinctus, segmentis oblongis obtusis. *Stamina* limbo vix breviora. *Stylus* elongatus.

CAPE COLONY. George Division: Montagu Pass, *Penther*, 713.

790. **Hesperantha Pentheri**, *Baker* [Iridaceæ]; inter *H. graminifoliam*, Ker-Gawl., et *H. Baurii*, Baker, medium tenens.

Cormus parvus, globosus, tunicis exterioribus rigidis brunneis basi laceratis. *Caulis* gracilis, teres, profunde sulcatus, 3–6 poll. longus, foliis tribus linearibus planis glabris enatis 2–4 poll. longis, superiore ab inferioribus sæpissime remoto. *Spica* biflora, floribus erectis; spatha exterior oblonga, 4–6 lin. longa, ad apicem viridis. *Perianthii* tubus cylindricus, spathæ æquilongus; limbi segmentis oblongis obtusis albis vel exterioribus

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dorso rubro tinctis. *Antheræ* lineares, 2 lin. longæ, filamentis longiores. *Stylus* ex tubo longe exsertus.

CAPE COLONY. Clanwilliam Division: Olifants River, *Penther*, 625, 686.

791. **Lapeyrousia Pentheri**, *Baker* [Iridaceæ]; ad *L. Fabricii*, Ker-Gawl., arcte accedit; differt spathis tuboque brevioribus.

Cormus parvus, globosus, tunicis duris nervosis, collo elongato. *Folia* basalia 3–4, linearia, patula, glabra, 1–1½ poll. longa. *Pedunculus* brevis, anguste alatus. *Inflorescentia* laxissima, ramosa, ramis strictis erecto-patentibus; spicæ 1–3-floræ, floribus erectis; spatha exterior viridis, rigidula, oblonga, 2 lin. longa. *Perianthii* tubus albus, 12–15 lin. longus; limbi segmenta oblanceolata, 3–4 lin. longa. *Stamina* limbo duplo breviora. *Stylus* staminibus æquilongus.

CAPE COLONY. Swellendam Division: Breede river, *Penther*, 728.

792. **Watsonia caledonica**, *Baker* [Iridaceæ]; ad *W. densifloram*, Baker, accedit; differt spathis multo minoribus ad axin appressis, perianthii tubo graciliore, limbi segmentis oblongis obtusis.

Cormus ignotus. *Folia* basi 3–5, linearia, erecta, rigida, glabra, inferiora semipedalia vel pedalia. *Caulis* simplex, 6–9 poll. longus. *Spica* densa, erecta, 3–6 poll. longa; spatha exterior lanceolata, rigida, brunnea, 1 poll. longa. *Perianthii* tubus gracilis, curvatus, spathæ æquilongus; limbus 9 lin. longus, albo-rubellus, segmentis oblongis obtusis. *Antheræ* lineares, 2 lin. longæ, filamentis breviores. *Stylus* ex tubo exsertus, ramis divaricatis profunde furcatis.

CAPE COLONY. Caledon Division: Leos Kraal, *Penther*, 718, 724.

793. **Babiana orthosantha**, *Baker* [Iridaceæ]; ad *B. strictam*, Ker-Gawl., accedit; differt perianthii tubo elongato.

Cormus globosus, 1 poll. diam., tunicis exterioribus laxe fibrosis. *Folia* basalia circiter 5, petiolata, lanceolata, 3–8 poll. longa, plicata, pilosa, basi inæqualia. *Pedunculus* brevis, simplex. *Spica* 4–6-flora; spatha exterior lanceolata, pilosa, 6–9 lin. longa. *Perianthium* saturate violaceum; tubus gracilis, pollicaris; limbus erectus, 9 lin. longus, segmentis oblanceolato-oblongis mucronatis. *Antheræ* lineares, filamentis æquilongæ. *Stylus* ex tubo breviter protrusus.

CAPE COLONY. Clanwilliam Division: Olifant's river, *Penther*, 672, 741.

794. **Acidanthera Schinzii**, *Baker* [Iridaceæ]; ad *A. brevicollem*, Baker, accedit; differt folio perfecto solitario, flore solitario, antheris sagittatis.

Cormus globosus, parvus, tunicis brunneis duris apice breviter setosis. *Caulis* gracilis, flexuosus, monocephalus, 6–9 poll. longus, folio perfecto unico lineari marginibus revolutis supra basin

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prœdito, foliis reductis vaginatis superpositis 2–3. *Spatha* exterior lanceolata, firma, viridis, 1 poll. longa. *Perianthium* lilacinum; tubus gracilis, cylindricus, 9–10 lin. longus; limbus pollicaris, segmentis æqualibus oblongis obtusis. *Stamina* unilateralia, limbo vix breviora, antheris linearibus magnis basi sagittatis. *Stylus* limbo subæquilongus.

CAPE COLONY. Caledon Division: Houw Hoek, *Penther*, 587, ex parte.

795. **Hæmanthus (Nerissa) Cecilæ**, *Baker* [Amaryllidaceæ]; ad *H. zambesiacum*, Baker, magis accedit; differt perianthii tubo longiore, limbi segmentis quam tubo duplo longioribus.

Bulbus magnus. *Folia* oblonga, obtusa, ad basin attenuata, membranacea, glabra, venis primariis inter costam et marginem 9–10, venulis intermediis crebris obliquis. *Pedunculus* validus, lateralis, infra conspicue rubro-brunneo maculatus. *Umbella* globosa, densa, 5–6 poll. diam.; spathæ valvis pluribus lanceolatis reflexis 15–18 lin. longis, pedicellis 12–15 lin. longis. *Perianthium* saturate rubrum, tubo cylindrico 4–4½ lin. longo, limbi segmentis linearibus uninervatis quam tubo duplo longioribus flore expanso erecto-patentibus. *Stamina* limbo paullo longiora, filamentis rubris, antheris oblongis parvis luteis.

RHODESIA. Matabeleland: between Salisbury and Buluwayo, *Hon. Mrs. Evelyn Cecil*, 76.

796. **Eriospermum Cecili**, *Baker* [Liliaceæ-Asphodeleæ]; ad *E. Mackenii*, Baker, magis accedit; differt foliis parvis lanceolatis distincte petiolatis, racemo paucifloro subcorymboso.

Tuber haud visum; collum elongatum tunicis fibrosis vestitum. *Folia* 2 synanthia, distincte petiolata, lanceolata, 1–2 poll. longa, medio 5–6 lin. lata, subcoriacea, glabra. *Pedunculus* gracilis, flexuosus, glaber, 3–4 poll. longus. *Racemus* 8–12-florus, subcorymbosus; bracteæ ovatæ, parvæ; pedicelli erecto-patentes, apice articulati, inferiores 9–12 lin. longi. *Perianthium* campanulatum, luteum, 3 lin. longum, segmentis lineari-oblongis obtusis dorso viridi-brunneis. *Stamina* perianthio paullo breviora; antheræ oblongæ, parvæ, luteæ. *Ovarium* globosum, stylo quam ovario paullo longiore.

RHODESIA. Mashonaland: Inyanga Plateau, 6000–7000 ft., *Mr. Evelyn Cecil*, 204.

797. **Anthericum (Phalangium) recurvifolium**, *Baker* [Liliaceæ-Asphodeleæ]; ad *A. ancipitem*, Baker, magis accedit; differt pedunculo terete, racemis pluribus, bracteis parvis et pedicellis subnullis solitariis.

Folia exteriora rudimentaria, crassa, rigidula, ex apice in fibris dissoluta, interiora perfecta 5–6, linearia, rigidula, glabra, patula, recurvata, 3–6 poll. longa, conspicue crebre nervata. *Pedunculus* erectus, teres, semipedalis, foliis 2 brevibus erectis instructus. *Panicula* rhomboidea, 8–9 poll. longa, ramis pluribus laxifloris

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ascendentibus; bracteæ ovatæ, parvæ; pedicelli solitarii brevissimi. *Perianthium* album, 6 lin. longum, segmentis dorsi rubro-brunneis 5-nervatis. *Stamina* perianthio paullo breviora; antheræ luteæ, 2 lin. longæ; filamenta brevia, applanata. *Ovarium* globosum, stylo elongato curvato.

RHODESIA. Mashonaland, at 6-mile Spruit, near Salisbury, *Hon. Mrs. Evelyn Cecil*, 143.

798. **Scilla (Ledebouria) ciliata**, *Baker* [Liliaceæ-Scilleæ]; ad *S. Sandersoni*, Baker, magis accedit; differt foliis longioribus obtusis ciliatis, racemo laxo oblongo.

Bulbus parvus. *Folia* oblongo-lanceolata, obtusa, 5–6 poll. longa, medio 15 lin. lata, e medio ad basin sensim attenuata, viridia, versus marginem pulchre rubro tincta, ad marginem subtiliter ciliata. *Pedunculus* gracilis, viridis, immaculatus, flexuosus, 4 poll. longus. *Racemus* oblongus, laxus, 2 poll. longus, bracteis minutis viridibus lanceolatis, pedicellis 3–4 lin. longis, centralibus patulis apice cernuis. *Perianthium* campanulatum, saturate rubro-purpureum, 1½ lin. longum, segmentis lineari-oblongis late viridi-vittatis. *Filamenta* saturate purpurea, perianthio æquilonga.

RHODESIA: Mashonaland; collected at 40-mile hill and also at Inyanga, 6000–7000 ft., very common, *Hon. Mrs. Evelyn Cecil*, 165.

799. **Androcymbium decipiens**, *N. E. Brown* [Liliaceæ-Anguillarieæ]; similis *A. natalensi*, Baker, sed perianthio duplo majore laminis tenuioribus et quam staminibus duplo longioribus.

Bulbus 4–5 lin. crassus, brunneus. *Folia* 3–4, conferta, 2–5 poll. longa, 3–4 lin. lata, linearia vel lineari-lanceolata, acuta, glabra. *Perianthii* segmenta alba, carneo-lineata, glabra, unguibus 5 lin. longis, laminis 7 lin. longis, 1½ lin. latis, lineari-oblongis, obtusis vel subacutis, basi cucullatis. *Stamina* 3–3½ lin. longa, glabra. *Ovarium* ovoideum, glabrum; styli 4 lin. longi.

NATAL. Tongaat, at 200 ft., *Miss Rich in Herb. Wood.*, 5764.

800. **Eragrostis Dinteri**, *Stapf* [Gramineæ-Festuceæ]; affinis *E. majori*, Host, sed spiculis exceptis undique glandulosa, spiculis latioribus admodum compressis, glumis valvisque acute acuminatis, illis in carinis spinuloso-ciliolatis diversa.

Gramen annuum, a basi ramosum, fere undique spiculis exceptis glandulis sessilibus-patelliformibus (exsiccando collapsis ?) obsitum. *Culmi* ascendentes, ultra 1 ped. alti, in foliorum axillis sæpe ramos breves floriferos gerentes, glabri, 3–6-nodi, nodis superioribus quidem exsertis purpureis. *Foliorum vaginæ* magis minusve carinatæ, striatæ, ore barbatæ, ad margines longiuscule molliter pilosæ; *ligulæ* ad pilorum mollium seriem redactæ; *laminæ* lineares, apicem versus longe attenuatæ, 2–3 poll. longæ, 2–2½ lin. latæ, planæ, supra pilosæ, dense striatæ, subtus glabræ. *Panicula* oblonga vel ovoidea, stricta, 3–5 poll. longa, 1–1½ poll. lata; rhachis

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ramulique angulati, ad angulos scabri vel spinuloso-ciliolati, hicce ut pedicelli basi barbulati; pedicelli laterales plerumque breves vel brevissimi. *Spiculæ* a latere admodum compressæ, ovatæ vel ovato-oblongæ, acutissimæ, 3–5 lin. longæ, circa 2 lin. latæ, purpureo-variegatæ vel aureo-flavidæ, multifloræ. *Glumæ* a latere anguste lanceolatæ, acutissimæ, acute carinatæ, carinis marginibusque spinuloso-ciliolatis, 1¾–2 lin. longæ, inferior 1-nervis, superior 3-nervis. *Valvæ* a latere ovato-lanceolatæ, acute longiuscule acuminatæ, ad 2 lin. longæ, 3-nerves, carinis superne spinuloso-scabris, lateribus scaberulis. *Paleæ* curvatæ, 1 lin. longæ, carinis spinuloso-ciliolatis. Antheræ ½–⅔ lin. longæ.

GERMAN SOUTH-WEST AFRICA. Hereroland: near Ossire, *Dinter*, 484.

III.—NEW ORCHIDS.—DECADE 26.

251. **Pleurothallis venosa**, *Rolfe*; *P. Jamiesoni*, Lindl., accedit, sepalis petalisque fusco-striatis recedit.

Caules teretes, 6–9 poll. longi, 2½ lin. lati, vaginis tubulosis vestiti. *Folia* breviter petiolata, lanceolato-oblonga, subobtusa, 5½–8 poll. longa, 1¼–1¾ poll. lata; petioli 1–1½ poll. longi. *Spathæ* florentes ¾ poll. longæ. *Racemi* 2 v. 3, fasciculati v. rarius solitarii, graciles, arcuati, 4–6 poll. longi, multiflori. *Bracteæ* tubulosæ, oblique truncatæ, ½–¾ lin. longæ. *Pedicelli* 1½ lin. longi. *Sepalum* posticum elliptico-oblongum, subobtusum, concavum, 2 lin. longum; lateralia ad medium connata, oblonga, subobtusa, 2 lin. olnga. *Petala* lanceolato-oblonga, subobtusa, 1½ lin. longa. *Labellum* trilobum, ¾ lin. longum, lobis lateralibus erectis rotundatis, lobo intermedio late rotundato obtuso. *Columna* ½ lin. longa.

TROPICAL AMERICA.

Introduced by Messrs. F. Sander & Co., and flowered in their Nursery in October, 1890. Flowers greenish, with three dusky brown longitudinal nerves on the sepals and a single one on each petal.

252. **Cryptophoranthus Moorei**, *Rolfe*; *C. hypodisco*, Rolfe, accedit, sed ovarii alis valde undulatis et perianthii venis non piloso-cristatis differt.

Caulis brevis, gracilis, vaginis tubulosis apiculatis obtectus. *Folia* breviter petiolata, late elliptica, subobtusa et minute tridenticulata, coriacea, 1½ poll. longa, 1 poll. lata; petioli 3 lin. longi. *Flores* axillares, pedicellis gracilibus brevibus suffulti; bracteæ ellipticæ, carinatæ, apiculatæ, basi tubulosæ, 2 lin. longæ. *Ovarium* 2 lin. longum, sexangulare, angulis bialatis et valde undulatis. *Perianthium* 9 lin. longum, apice decurvum, apiculatum, postice tenuiter 7-carinatum, carinis crenulatis; fenestra 5 lin. longa. *Petala* late ovata, subobtusa v. apiculata, 1½ lin. longa.

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Labellum trulliformi-sagittatum, acutum, papillosum, 2½ lin. longum; unguis latus, verrucosus. *Columna* clavata, 1¾ lin. longa.

TROPICAL AMERICA.

Introduced by Messrs. Hugh Low & Co., in 1884, and flowered with Mr. F. W. Moore, A.L.S., at the Royal Botanic Gardens, Glasnevin, in September, 1899. The perianth is dull purple, with some pale stripes between the keels, and a pale fleshy disc, which is somewhat spotted opposite to the lateral openings. The interior organs are wholly purple. The leaves are dull green above, somewhat mottled with dull purple, and the under surface uniformly purple.

253. **Liparis Lloydii,** *Rolfe*; inter species Africanas foliis subspathulatis facile distinguitur.

Herba cæspitosa. *Caulis* brevis, basi paullo incrassatus, 2–3-phyllus. *Folia* suspathulato-oblonga, obtusa, 2½–3½ poll. longa, 3–4 lin. lata, subcoricea. *Scapus* 3–4 poll. altus; racemus pauciflorus; bracteæ lanceolatæ, acuminatæ, recurvæ, 2–2½ lin. longæ; pedicelli 2–3 lin. longi. *Sepalum* posticum lineare, 3–4 lin. longum; lateralia late falcato-oblonga, obtusa, 2 lin. longa. *Petala* linearia, 2½ lin. longa. *Labellum* orbiculari-obcordatum, 1½ lin. longum, basi ecallosum; discus trinervius, utrinque nervo arcuato paullo incrassato instructus. *Columna* arcuata, 1¼ lin. longa.

W. TROP. AFRICA. Old Calabar, *Lloyd.*

Received, together with a pencil drawing, from Mr. J. H Holland, Botanic Garden, Old Calabar. "Flowers green."

254. **Dendrobium** (§ **Cadetia**) **Schinzii,** *Rolfe;* affine *D. lonchophyllo*, Hook. f., sed foliis brevioribus, labelli auriculis suborbicularibus differt.

Caules primarii repentes, vaginis membranaceis obtecti, secundarii pseudobulbos oblongos ¾–1½ poll. longos incrassatos, monophyllos formantes. *Folia* sessilia, ovato- v. elliptico-oblonga, subacuta, 2–2½ poll. longa, 7–9 lin. lata. *Flores* solitarii v. fasciculati, breviter pedicellati. *Sepalum* posticum elliptico-oblongum, subacutum, 2 lin. longum; lateralia triangulari-ovata, subobtusa; 3 lin. longa. *Petala* oblonga, subacuta, 2 lin. longa. *Labellum* 4 lin. longum, trilobum; lobi laterales triangulares, truncati; lobus intermedius basi quadratus, apice appendices auriculiformes suborbiculares duo ferentes. *Columna* brevissima. *Mentum* latum, 3 lin. longum.

SUMATRA.

Sent by Dr. Hans Schinz from the Zurich Botanic Garden, where it flowered in November, 1899. The flowers are pale green, and very fugacious.

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255. **Dendrobium Hodgkinsoni**, *Rolfe*; *D. atroviolaceo*, Rolfe, accedit, foliis elliptico-lanceolatis, floribus immaculatis, sepalis acuminatis lateralibus valide carinatis, petalis lanceolatis, labello subtrilobo, callo magno abrupte elevato differt. *Bot. Mag.*, t. 7724.

Pseudobulbi clavati, canaliculati, 5–10 poll. longi, apice 2–3-phylli. *Folia* elliptico-lanceolata, subacuta, subcoriacea, 4–7 poll. longa, 1–1¾ poll. lata. *Scapi* terminales, erecti, circiter 4 poll. longi, prope apicem 5–7-flori. *Bracteæ* oblongæ, subobtusæ, 3–4 lin. longæ. *Pedicelli* 1 poll. longi. *Sepalum* posticum triangulari-lanceolatum, acuminatum, 12-14 lin. longum; lateralia falcato-triangularia, acuminata, valide carinata, 12–14 lin. longa, basi 6 lin. lata. *Petala* lanceolata, acuminata, 12–14 lin. longa. *Labellum* subtrilobum, recurvum, 12–14 lin. longum, lobis lateralibus erectis rotundatis crenulatis, lobo intermedio cordato-ovato acuto, callo magno abrupte elevato tricarinato basi utrinque dente ornato. *Columna* lata, 2½ lin. longa. *Mentum* obtusum, 5 lin. longum.

NEW GUINEA.

Introduced by Messrs. F. Sander & Co., together with *Dendrobium spectabile*, Miq., and flowered in their establishment, also in the collection of Dr. Hodgkinson, The Grange, Wilmslow, during 1899. The sepals and petals are light green, and the lip veined with purple all over in radiating lines, and bearing a large white shining keeled crest, with an additional tooth on each basal angle.

256. **Dendrobium** (§ **Stachyobium**) **Madonnæ**, *Rolfe*; *D. Fairfaxii*, Rolfe, accedit, sed petalis obovatis, labelli lobo intermedio obcordato apiculato, et lobis lateralibus latissimis intermedio æqualibus facile distinguitur. *Bot. Mag.*, t. 7900.

Pseudobulbi 3–9 poll. longi, basi graciles, prope apicem fusiformes, sulcati, 2–3-phylli. *Folia* elliptico-oblonga, subobtusa, 1½–2½ poll. longa, subcoriacea. *Scapi* terminales, 2½ poll. longi, 3-flori. *Bracteæ* oblongæ, subacutæ, 2 lin. longæ. *Pedicelli* 1 poll. longi. *Sepalum* posticum lanceolato-oblongum, acutum, 8–9 lin. longum; lateralia subfalcata, acuta, 7–8 lin. longa, basi lata. *Petala* oblique obovata, apiculata, 9–10 lin. longa. *Labellum* 9–10 lin. longum, 11–12 lin. latum, subtrilobum, lobis lateralibus latissimis obtusis, lobo intermedio brevi obcordato apiculato, callo oblongo tricarinato medio ad basin extenso. *Columna* brevissima apice tridentata.

NEW GUINEA.

Introduced by Messrs. F. Sander & Co., and flowered in their Nursery in December, 1899. Flowers white, except a light green suffusion on the disc of the lip, and a marginal row of dark violet-purple spots at the apex of the side lobes.

257. **Bulbophyllum Mahoni**, *Rolfe*; *B. aurantiaco*, Hook. f., accedit, foliis plus duplo brevioribus et floribus duplo minoribus differt.

Rhizoma repens. *Pseudobulbi* late oblongi, subcompressi, monophylli, circiter 1 poll. longi. *Folia* oblonga, subobtusa, coriacea,

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2–2½ poll. longa, 8–9 lin. lata. *Scapi* ascendentes, graciles, 3½–5 poll. longi; racemi multiflori. *Bracteæ* oblongæ v. oblongo-lanceolatæ, subacutæ, 2 lin. longæ. *Pedicelli* 1 lin. longi. *Sepala* triangulari-lanceolata, acuta, 2–2½ lin. longa. *Petala* elliptico-oblonga, obtusa, ¾ lin. longa. *Labellum* recurvum, linear-oblongum, obtusum, integrum, ¾ lin. longum. *Columna* lata, ½ lin. longa; dentes subulati. *Capsulæ* obovoideæ, 2½ lin. longæ.

BRITISH CENTRAL AFRICA. Nyassaland, Mlanje foot-hills at 4000 ft. (on *Uapaca kirkiana*), *Mahon.*

The sepals are deep saffron-orange, becoming nearly white at the base, and their structure indicates a near affinity with the western *B. aurantiacum*, Hook. f., which, however, is a much larger plant.

258. **Zygopetalum** (§ **Zygosepalum**) **Ballii**, *Rolfe*; *Z. rostrato*, Hook., accedit; sepalis petalisque latioribus non longe acuminatis, purpureis, labello convexo, crista magna, et rostello brevi differt. *Gard. Chron.*, 1900, i., p. 149, f. 47, *sine descriptione.*

Pseudobulbi oblongi, compressi, 1–1¾ poll. longi, 6–9 lin. lati, 3–4-phylli. *Folia* lanceolata, plicata, 5–8 poll. longa, 1–1¼ poll. lata. *Scapus* 4 poll. altus, uniflorus. *Bractea* spathacea, ovato-lanceolata, acuta. *Pedicellus* 1½ poll. longus. *Sepala* late lanceolata, acuta, 1¾ poll. longa, 7 lin. lata. *Petala* lanceolata, acuta, sepalis paullo minora. *Labellum* suborbiculare, subacutum, convexum, 1¼ poll. latum; callo hippocrepico magno apice crenulato. *Columna* clavata, 1 poll. longa, alis rotundatis, clinandrio denticulato, rostello triangulari brevi.

BRAZIL: in the province of Pernambuco.

Imported by Messrs. John Cowan & Co., Liverpool, with *Cattleya labiata*, Lindl., and flowered in the collection of G. S. Ball, Esq., Ashford, Wilmslow, in June, 1898. The sepals are light reddish purple, margined with cream-white, the petals similar, but somewhat mottled near the apex, and the lip white, with an irregular reddish purple zone and several small spots and lines round the crest, which latter is violet-purple in front, and veined with a similar colour on a white ground behind. The column is white, lined with purple in front, and spotted on the wings.

259. **Pescatorea cochlearis**, *Rolfe*; affinis *P. dormannianæ*, Rchb. f., sed labello cochleare differt.

Folia oblanceolato-oblonga, acuta, 5–9 poll. longa, ¾–1¼ poll. lata. *Scapi* horizontales, 3–3½ poll. longi; bractea late ovata, obtusa, cucullata, 5–6 lin. longa; pedicellus 9 lin. longus. *Sepala* late elliptico-oblonga, apiculata, concava, 1¼ poll. longa, 9–10 lin. lata. *Petala* oblonga, apiculata, 1¼ poll. longa, 7–8 lin. lata. *Labellum* 1 poll. longum, trilobum, lobis lateralibus auriculatis parvis incurvis, lobo intermedio cochleare truncato 10 lin. lato, papillis

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filiformibus dense ornato, margine incurvo, callo magno hippocrepiformi cristis 17 ornato. *Columna* clavata, 9 lin. longa, basi utrinque angulata.

ANDES.

Flowered in the collection of Frau Ida Brandt, Zurich, in November, 1899. The lower halves of the sepals and petals are ivory white, and the upper parts reddish maroon. The lip is white, the crests, tubercles, and column maroon. The three central crests of the callus are longer than the others, the median one extending to the base in a narrow keel, while on either margin a row of small teeth extend to the base, as in *P. dormaniana*, Rchb. f., which however is different in shape and colour.

260. **Colax tripterus**, *Rolfe*; affinis *C. placanthero*, Lindl., sed ovario triptero et labelli disco callo lato carnoso instructo differt.

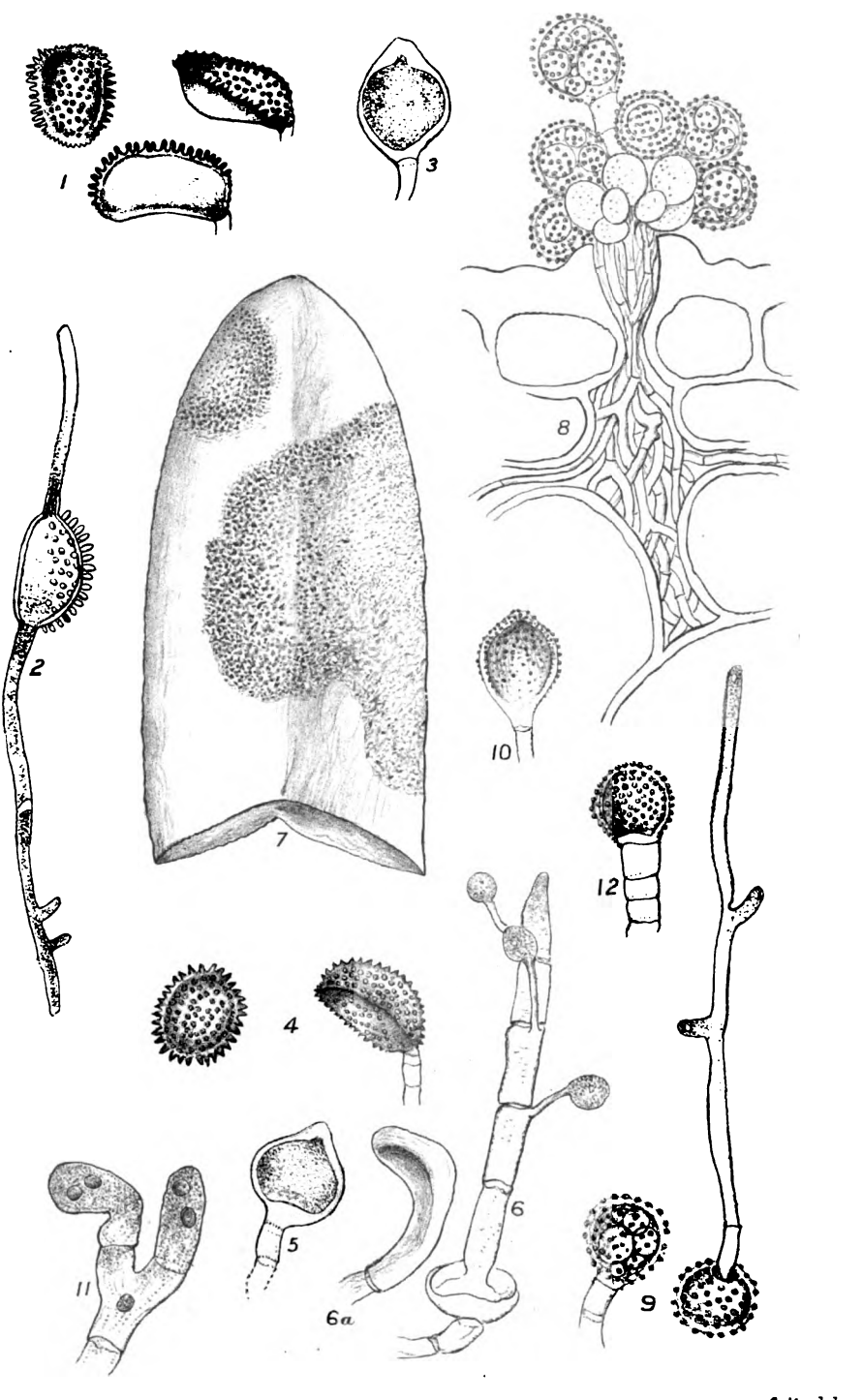
Folia lanceolata, acuminata, plicata, 4 poll. longa. *Scapi* erecti, 4 poll. longi, biflori. *Bracteæ* ovato-lanceolatæ, acuminatæ, ¾–1 poll. longæ. *Ovarium* pedicellatum, 1 poll. longum, alis tribus angustis instructum. *Sepala* oblonga, apiculata, 11–14 lin. longa. *Petala* oblonga, sepalis subæqualia. *Labellum* trilobum, 10–12 lin. longum, basi breviter unguiculatum, lobis lateralibus erectis oblongis obtusis curvatis, lobo intermedio orbiculari-elliptico, disco callo lato carnoso instructo. *Columna* clavata, 8 lin. longa, angulata, facie carinata; alæ angulatæ minute crenulatæ.

BRAZIL.

Flowered in the Royal Botanic Gardens, Glasnevin, in June, 1896, having been received as *Colax jugosus*, Lindl. The sepals and petals are light green, the former unspotted and the latter densely speckled with dark brown, and the lip yellowish white with lines of minute light purple dots on the fleshy disc.

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G.M.. del.

Hemileia

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ROYAL BOTANIC GARDENS, KEW.

BULLETIN

OF

MISCELLANEOUS INFORMATION.

No. 2. 1906.

IV.—REVISION OF THE GENUS HEMILEIA, BERK.

(*With Plate.*)

The discovery of two additional species of *Hemileia* has rendered necessary a redescription of all known species included in the genus, which up to the present have been very inadequately described in systematic works, the uredo-spore phase alone being mentioned.

It is somewhat remarkable that no attempt appears to have been made by those engaged in studying the life-history of *Hemileia vastatrix*, Berk. and Broome, the cause of the much dreaded coffee-leaf disease in Ceylon and elsewhere, to ascertain whether or not an Aecidium condition existed; the presence of both uredo- and teleuto-spore stages strongly suggesting the probability of the presence of such.

This probability receives further support from the fact that there exist four species of *Aecidium* as yet not correlated with uredo- or teleuto-spore stages, parasitic on the same or closely allied plants as those on which the various species of *Hemileia* are parasitic, and also occurring in the same countries as the latter. These species are as follows:—

Aecidium Vangueriae, Cooke, on *Vangueria infausta*, Burch, and *V. latifolia*, Sond., Natal. "Often on the same plant, sometimes on the same leaves as *Hemileia Woodii*, K. & C." (Cooke, Grevillea, x. p. 124.)

Aecidium Pavettae, Berk. and Broome, and *A. flavidum*, Berk. and Broome, on *Pavetta indica*, L.; Ceylon.

Aecidium Plectroniae, Cooke, on *Plectronia Cueinzii*, J. M. Wood, Natal.

Should heteroecism be proved to exist in the genus, the fact would be of value in any attempt to arrest the extension of parasitic species.

Two species, *Hemileia vastatrix*, Berk. and Broome, and *H. Woodii*, Kalchbr. and Cooke, are now known as parasites on

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species of *Coffea*, and as these species are shown to be parasitic on several other rubiaceous plants belonging to different genera, which have an extended geographical range, their distribution should be carefully studied by those interested in the culture of coffee. The establishment of a coffee plantation in a district where those species of *Hemileia* capable of infecting coffee are present on indigenous vegetation, would be tempting providence, and probably result in disaster.

Hemileia vastatrix, Berk. and Broome, has not been collected on *Coffea arabica*, L., nor on *C. liberica*, Hiern, when growing wild, but it is recorded as occurring on *Coffea arabica*, L., var. *Stuhlmannii*, Warb., by Hennings,* who writes as follows :—

"Auch *Hemileia vastatrix* ist jedenfalls in Afrika ursprünglich und von hier in die verschiedensten Tropenländer verschleppt worden. Auf Blättern von Coffea arabica var. Stuhlmannii Warb., am Victoria Nyanza bei Bukoba von Dr. Stuhlmann im März 1897, gesammelt, wurde von Dr. Warburg gleichfalls dieser Pilz beobachtet, woraus mit Sicherheit hervorgeht, dass diese Kaffeeblattkrankheit nicht erst durch von den Europäern eingeführte Kaffeesaat nach Deutsch-Ost-Afrika gekommen ist."

It is not at all necessary to assume that the coffee disease has been imported along with the coffee plant from one country to another, taking into consideration the wide distribution of different species of plants attacked by *Hemileia vastatrix*, Berk. and Broome, or *H. Woodii*, Kalchbr. and Cooke, both of which are capable of infecting species of *Coffea*.

Indigenous plants attacked by one or other of the above-mentioned species of *Hemileia* are distributed as follows :—

Ceylon, *Plectronia campanulata*, Beddome, *Coffea travancorensis*, Wight and Arn.; Southern India, *Coffea travancorensis*, Wight and Arn.; China, *Gardenia jasminoides*, Ellis; Java, *Gardenia*, two spp. undetermined; Africa, *Coffea arabica*, L. var. *Stuhlmannii*, Warb., *Craterispermum laurinum*, Benth., *Vangueria infausta*, Burch., *V. latifolia*, Sond., *V. euonymoides*, Schweinf., *V. madagascarensis*, J. F. Gmel; Queensland, *Gardenia edulis*, F. v. Muell.

The wide geographical range of the genus *Hemileia* is further illustrated by the discovery of a species parasitic on an orchid—*Cattleya dowiana*, Batem., from Costa Rica. Repeated experiments prove that the spores of this species will not inoculate the coffee plant.

Preventive measures against Hemileia.—Until the life history of the fungus is known preventive means can only be followed on the rule-of-thumb system; in other words the fungus cannot be attacked at the most vulnerable point during its development.

Marshall Ward has shown that the uredo-spores, when placed on the surface of a coffee leaf, germinate, the germ-tube enters the tissues of the leaf, and in about a fortnight's time the disease

* Zeit. Trop. Landw. der Tropenpflanzer, No. 8, 1897, p. 192.

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appears. As to whether the secondary spores borne on the promycelium of germinating teleutospores can directly inoculate a coffee leaf is not known, probably not; at least I have determined that the secondary spores of *Hemileia americana* cannot inoculate the host that produces uredospores. The question then arises, which species of plant is inoculated by the secondary spores? Finally, does an *Aecidium* stage exist? As already stated there is evidence in favour of its existence; again, if so, on what host-plant does it occur? All these doubtful points must be definitely settled before we can hope to successfully combat and exterminate the disease.

In the meantime, as usual in the Uredineae, the epidemic or rapid spread of the disease is due to the uredospore stage of the fungus. In places where the nature of the ground and other circumstances admit of spraying, Bordeaux mixture is the most effective fungicide to use. The mixture should be only half the normal strength, otherwise the youngest foliage suffers.

A cyclone nozzle should be used as a very fine spray is necessary, otherwise the mixture accumulates into minute drops, and rolls off the smooth surface of the leaf. A quantity of blood serum dissolved and added to the fungicide causes it to adhere better to the surface of the leaf.

Diseased fallen leaves should be collected and burned, otherwise the teleutospores which mostly mature after the uredospores, are dispersed far and wide on the dry leaves, and in due course infect indigenous plants, the resulting crop of uredospores in turn attacking the cultivated coffee.

The following note by Balansa,* a well known botanical collector, on a method of cultivating coffee which enabled it to resist the disease, as practised in Tonkin, on the slopes of Mount Bavi, near Tu-Phap, at an elevation of about 1,600 feet, is of interest.

"Il y a quelques mois je vous a fait parvenir des feuilles de caféier attaquées par *l'Hemileia*. Vous en désiriez de plus caractérisées. Les voici. *l'Hemileia* a déjà fait d'assez grands ravages dans deux de nos champs d'essai, mais dans un troisiéme occupant un petit plateaux argileux, les caféiers qui étaièntinféctés du parasite quand je les ai transplantés, en sont, actuellement tout à fait débarrassès. Il faut vous dire qu'ils sont en plein soleil, sans abri, et qu'ils ont même un peu souffert des insolations. Je compte beaucoup sur eux. Si mis espérances se réalisent, il en résulterait qu'on a bien tort dans certains pays, de planter les caféiers sous des arbres, c'est la plus sûr moyen de propager la maladie.

HEMILEIA, *Berk. and Broome* (emended).

I. (Aecidium stage). Unknown.

II. (Uredo stage). Forming effused pulverulent, orange patches on the under surface of living leaves, or on young shoots and fruit; uredospores grouped in small heads or clusters, produced at

* C. Roumeguère Fung. Sel. Exs., No. 4,500.

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the apex of fascicles of hyphæ emerging through the stomata, reniform or subglobose, the whole or a portion only of the epispore warted ; germ-pores 3–5.

III. (Teleutospore stage). Teleutospores originating from the centre of the heads of uredospores after the latter are fully developed, unicellular, broadly ovate, umbonate ; germ-pore apical ; promycelium simple, 3–4-septate, each septum producing a single sporidium borne on a slender sterigma.

In some species the head of uredo- and teleutospores is surrounded at the base by paraphyses.

Hemileia, Berk. and Broome, Gard. Chron., Nov. 6, 1869 ; Sacc. Syll., vii., p. 585 (1888).

Hemileia is very closely allied to the genus *Uromyces*, Link, from which it differs mainly in the fertile hyphæ emerging in fascicles solely through the stomata to produce their spores on the surface of the affected part of the host.

Hemileia vastatrix, *Berk. and Broome*, Gard. Chron., Nov. 6, 1869, p. 1157, 1 fig..

I. Unknown.

II. Hypophyllous ; commencing as small irregularly circular patches ; if numerous, the patches during increase in size blend together, and not unfrequently cover the greater portion of the leaf ; uredospores produced in small heads, subreniform, triangular in section, the free convex surface covered with small warts, and bounded by a row of longer, crowded, spinose warts ; the two lateral surfaces that are in contact with adjoining spores, smooth, 30—40 × 28—30 μ ; pedicel slender, short ; germ-pores 3–5 ; germ-tube elongated, with one or more vesiculose swellings, irregularly branched.

III. Teleutospores occupying the centre of the heads of uredospores, broadly depressed-ovate, umbonate ; epispore smooth, contents orange, averaging 30 × 25 μ ; pedicel slender, short ; promycelium tube simple, 3–4-septate, each segment giving origin to a single subglobose sporidium 8 — 10 μ diameter, borne at the apex of a slender sterigma.

Hemileia vastatrix, Berk. and Broome, Linn. Soc. Journ. (Bot.) XIV., 1875, p. 93 ; Sacc. Syll. n. 2102, p. 585 (1888).

Hemileia Canthii, Berk. and Broome, Linn. Soc. Journ. (Bot.) XIV., 1875, p. 93 ; Sacc. Syll. n. 2104, p. 586 (1888).

The fungus is most abundant on the under surface of living leaves, less frequently on young shoots or young fruit.

CEYLON. *Coffea arabica*, L. (cultivated) ; *Plectronia campanulata*, Beddome ; *Coffea travancorensis*, Wight and Arn.

INDIA. *Coffea arabica*, L. (cultivated), Mysore ; *Coffea travancorensis*, Wight and Arn., Travancore.

CHINA. *Coffea arabica*, L., and *C. liberica*, Hiern (cultivated) ; *Gardenia jasminoides*, Ellis.

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JAVA.
SUMATRA.
MALACCA.
SINGAPORE.
} *Coffea arabica*, L., and *C. liberica*, Hiern (cultivated).

PHILIPPINES. *Coffea arabica*, L., and *C. liberica*, Hiern (cultivated).

SAMOAN ARCHIPELAGO. *Coffea arabica*, L. (cultivated).

FIJI. *Coffea arabica*, L. (cultivated).

MAURITIUS. *Coffea arabica*, L. (cultivated).

MADAGASCAR. *Coffea arabica*, L. (cultivated).

AFRICA. *Coffea arabica*, L., Natal and German East Africa (cultivated); *Coffea arabica*, L., var. *Stuhlmannii*, Warb., near Bukoba, Victoria Nyanza; *Craterispermum laurinum*, Benth., Tropical Africa.

Somewhat variable in appearance on different hosts; and although the uredospores vary considerably within certain limits they always retain the reniform shape, and warted convex portion of the epispore surrounded by a row of longer spinulose warts.

Hemileia Woodii, *Kalchbr. and Cooke*, Grevillea, Vol. IX., 1880, p. 22.

I. Unknown.

II. Hypophyllous; uredospores aggregated in small heads, forming somewhat irregularly defined pulverulent orange patches 1–2 cm. across; spores broadly elliptical or subglobose, those situated near the periphery of the head often show a slight concavity on the surface in contact with other spores; epispore thickly studded with small warts of uniform size; averaging about 30 μ diameter; pedicel slender.

III. Teleutospores occupying the centre of the heads of uredospores, almost or quite colourless, broadly ovate, umbonate; epispore smooth, averaging 35 μ diameter; pedicel elongated, rather stout, septate; promycelium tube simple, 3–4-septate, each segment producing a subglobose sporidium 8—10 μ diameter, borne at the apex of a slender sterigma. The head of spores is surrounded by a varying number of slightly curved, smooth paraphyses, which are more or less triangular in section.

Hemileia Woodii, Kalchbr. and Cooke, Sacc., Syll. Fung., Vol. VII., n. 2103, p. 586 (1888); Zeitschr. Trop. Landw. der Tropenpfl., n. 8, 1897, p. 192.

AFRICA. Natal; on living leaves of *Vangueria infausta*, Burch., *V. latifolia*, Sond., *V. euonymoides*, Schweinf.

Near Bukoba, Kilimandscharo, on living leaves of *Vangueria madagascarensis*, J. F. Gmel.

Lindi, German East Africa, on living leaves of *Coffea Ibo*, Froehner.

JAVA. On living leaves of various species of *Gardenia*, Buitzenzorg Botanic Garden.

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QUEENSLAND. On living leaves of *Gardenia edulis*, F. v. Muell.; Gilbert River.

The paraphyses or cysts forming the outermost and basal portion of the head of spores are very variable in number and size, but can always be found, even when all the spores are mature; whereas in *H. vastatrix*, bodies similar in appearance, and occupying a like position, are present when the head is forming, but eventually develop into normal spores.

The teleutospores are more abundant in proportion to the uredospores in the present species than they are in *H. vastatrix*.

Hemileia americana, *Massee*. Gard. Chron., 1905, p. 153, fig. 53.

I. Unknown.

II. Hypophyllous; forming broadly effused pulverulent, deep orange-coloured patches, often several centimetres in extent; spores shortly stipitate, perfectly spherical; epispore bearing small, rather sparsely-scattered, round warts, 24 — 32 μ diameter; germ-pores two; germ-tubes cylindrical, bearing a few short branches.

III. The teleutospores occupy the central portion of the heads of uredospores, shortly stipitate, colourless, broadly obovate or turbinate, often with a small, obtuse, apical umbo; epispore closely covered with minute warts, averaging 30 × 25 μ.

COSTA RICA. On living leaves of *Cattleya dowiana*, Batem.

Only a small patch of rust was present on one leaf when the plant was received from Costa Rica, but this has continued to increase in size, and the falling spores have also inoculated other leaves.

The spores germinate readily, usually within 24 hours in various nutrient solutions, perhaps best in a very dilute decoction of dung. The inflated portions of the germ-tube, so characteristic of *H. vastatrix*, have not been observed in the present species. Young leaves of *Cattleya dowiana*, Batem., inoculated on the under surface with uredospores, produced mature uredospores 13 days after inoculation. Hitherto no success has attended the attempt to inoculate orchids belonging to other genera than *Cattleya*, neither has success attended the many attempts to inoculate *Cattleya* leaves with secondary spores produced by germinating teleutospores.

The mycelium is very abundant in the tissues; haustoria are absent.

Hemileia indica, *Massee*.

I. Unknown.

II. Hypophyllous; forming scattered, circular, pulverulent orange patches 3–5 mm. across; spores orange; epispore crowded with minute warts, spherical, with a broad circular hilum or point of attachment to the pedicel, averaging 25 μ diameter; pedicel longer than the diameter of the spore, 10 μ thick, 3-septate hyaline; germination unknown.

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III. Teleutospores occupying the central portion of the clusters of uredospores, broadly obovate to subglobose, hyaline; epispore smooth, averaging 18 — 20 μ diameter; germination unknown.

INDIA. Belgaum, Bombay; on living leaves of an undetermined species of *Macropanax* (*Major-Gen. Hobson*).

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DESCRIPTION OF THE FIGURES.

1. Uredospores of *Hemileia vastatrix*, Berk. and Broome, in various positions; × 400.

2. Uredospore of same, germinating; × 400.

3. Teleutospore of same; × 400.

4. Uredospores of *Hemileia Woodii*, Kalchbr. and Cooke; × 400.

5. Teleutospore of same; × 400.

6. Teleutospore of same, germinating; × 400.

6A. One of the paraphyses surrounding head of spores of same; × 400.

7. Patches of *Hemileia americana*, Massee, on portion of a leaf of *Cattleya dowiana*, Batem., nat. size.

8. Section through a leaf *a* above showing the mycelium emerging in a fascicle through a stoma, and bearing a head of uredo- and teleutospores; × 400.

9. Uredospores of same, one is germinating; × 400.

10. Teleutospore of same; × 400.

11. Intercellular mycelium of same; × 1,000.

12. Uredospore of *Hemileia indica*, Massee; × 400.

GEO. MASSEE.

V.—THE WILD FAUNA AND FLORA OF THE ROYAL BOTANIC GARDENS, KEW.

The publication of this work has long been delayed by unavoidable circumstances. It has now been issued as additional Series V. of the *Kew Bulletin* (pp. 223, with a plate). The late Director has contributed the following preface:—

"'Kew, as it exists to-day, was formed by the fusion of two distinct properties or domains, both Royal, but with entirely different histories. They correspond roughly to the west and east halves of the present gardens. The western half was known as Richmond Gardens. The eastern half corresponds in great part to the grounds of Kew House, and to this the name of Kew Gardens was originally confined. The two properties were separated by Love Lane, the ancient bridle road between Richmond and Brentford Ferry.' (*Kew Bulletin*, 1891, p. 281.)

"Richmond Lodge or House had been granted in 1707 by Queen Anne to the Duke of Ormonde. It was purchased from his family by George II. when Prince of Wales. It was a favourite residence of Queen Caroline, and was ultimately pulled down by George III. about 1771.

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"Kew House had been the residence of Lord Capel of Tewkesbury, a brother of the Earl of Essex. It was leased by Frederick, Prince of Wales, and was the home of his widow, the Princess Augusta of Saxe-Gotha, till her death. In 1759 she commenced the scientific history of Kew by establishing a Botanic or, as it was then called, a Physic Garden. George III. acquired the property, and in 1803 pulled down Kew House also. He obtained two Acts of Parliament empowering him to close Love Lane, but this was apparently not finally accomplished till 1802.

"The area of the Gardens as they at present exist is something under half a square mile. While the western half shows for the most part little evidence of the soil having been ever disturbed by cultivation, beyond being thickly planted with trees, this is not the case with the eastern half, much of which has at one time or another apparently been brought under the plough.

"In 1873 a member of the Kew staff (Curator from 1886 to 1901), Mr. George Nicholson, F.L.S., compiled a list of the native (and a few naturalised) plants occurring spontaneously at Kew. This was published in the *Journal of Botany* for 1875. Mr. R. I. Lynch, Curator of the Botanic Garden, Cambridge, also formerly a member of the Kew staff, materially contributed to its completeness from his own observations, and the late Lord de Tabley, better known to botanists as the Hon. John Leicester Warren, was keenly interested in it.

"In the *Kew Bulletin* for 1897 (pp. 115–167) a first attempt was made to catalogue the Mycologic Flora by Mr. G. Massee, F.L.S., a Principal Assistant in the Herbarium. The following passage is quoted from the prefatory note :—

"'Of the Royal Gardens themselves some 100 acres is little disturbed by any kind of cultivation, and it has certainly remained so for at least a century and a half. Some portions may never possibly have been subjected to cultivation at all. It is not surprising therefore that in the background of horticultural treatment there still subsists a wild fauna and flora of no inconsiderable dimensions. This, as opportunity offers, it is proposed to work out and catalogue from time to time.'

"The Moss Flora was contributed to the *Bulletin* for 1899 (pp. 7–17) by Mr. E. S. Salmon, F.L.S.

"Meanwhile Mr. Nicholson had steadily devoted his leisure hours to the comprehensive scheme contemplated in 1897. He enlisted the assistance of a number of scientific friends, specialists in various groups, to whom he communicated his enthusiasm for the work and without whose efficient help it would, even in a tentative form, have been impossible of achievement.

"I looked forward to this in Mr. Nicholson's hands with much interest and satisfaction. Unhappily, the breakdown of his health and his consequent retirement from the post of Curator in 1901 compelled him to abandon a labour to which he no longer felt equal. As there was no immediate chance of anyone carrying it on with Mr. Nicholson's energy, I decided to publish the material he had accumulated as at any rate a starting point for further

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research. I placed the papers in the hands of Mr. Pearson, M.A., F.L.S., who in the same year had been appointed an Assistant. He succeeded in preparing them for, and partially seeing them through the press when he in turn was obliged to abandon the task owing to his leaving for Cape Colony in 1903 to take up his duties as Professor of Botany in the South African College. Failing other assistance, I found it impossible to carry it to completion till I had myself been relieved of administrative duties.

"It appears to me that it is of considerable interest to show what a vast number of forms of life of the most varied kind may exist together on what is relatively a microscopic speck of the earth's surface. This would be in the present case even more striking if the enumeration were more complete than it can pretend to be. Some groups have not been worked at all; this is the case with the *Diptera*, and of the *Hemiptera* only the *Coccidæ* have been catalogued. Others, it is obvious, have been only touched superficially. The publication of what has been done may encourage working naturalists to correct errors and to accomplish, as perhaps has never been done yet, a complete census of every form of life occurring spontaneously in a small but well-defined area.

"I am glad to take the opportunity of acknowledging gratefully the assistance which has been given to those who have successively had a hand in the work by a very large number of individual workers in various branches of zoology and botany. Some of the most important are enumerated in the following 'Table of Contents.' I see from the mass of correspondence which has accumulated that there are a host of others, many personally unknown to me, who have cheerfully rendered the assistance which has been demanded of them on special points. I find it impracticable to specify them all individually, and can only beg them collectively to accept my appreciation of their aid.

"W. T. THISELTON-DYER.

"Kew, February, 1906."

"The abbreviations used are as follows:

"A. Arboretum. This includes the whole of what was formerly termed 'pleasure grounds.'

"B. Botanic garden. This division was formerly separated from the arboretum by a wire fence, which ran near Unicorn Gate, by north end of Pagoda vista, along eastern side of ash collection to Palace lawn.

"P. Palace and herbarium grounds.

"Q. Queen's Cottage grounds.

"R. Rock-garden.

"Strip. This is the piece of ground between the wall and the Thames, extending from end of herbarium grounds to the end of Queen's Cottage grounds."

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VI.—NEW AND ADDITIONAL SPECIES OF FUNGI OCCURRING IN THE ROYAL BOTANIC GARDENS, KEW.

(*With Plate.*)

As might have been expected the enumeration of the Fungi detected in the Royal Botanic Gardens, Kew, given by Mr. George Massee, F.L.S., in the *Wild Fauna and Flora* (pp. 103–184), although very extensive, has not by any means proved exhaustive. The following are undescribed and additional species which have been observed since the enumeration was in type :—

Dasyscypha abscondita, *Massee* (sp. nov.). (Figs. 1–6).

Ascomata 1·5–2 mm. alta, 1 mm. lata, gregaria, primo globosa dein cupulata, stipitata, extus margineque pilosa, albida ; pilis hyalinis, septatis, clavatis, 60–80 × 7–10 μ. *Asci* cylindracei,

In the Fern house, on wood received from Jamaica.

Pileus 3–4 cm. broad ; stem 6–8 cm. long. Very remarkable on account of the opalescent or iridescent tints of the thin, white gills.

Bolbitius umbonatus, *Massee* (sp. nov.). (Figs. 12–13).

Pileus tenuiter carnoso-membranaceus, subpellucidus, e conico campanulatus dein explanatus, umbonatus, profunde sulcatus glaberrimus, laete flavo-brunneus pallescens. *Lamellae* adnexae, latae, subdistantes, acie integrae, ferrugineo-flavae. *Stipes* sursum attenuatus, albus, basi marginato-bulbosus. *Sporae* ellipsoideae, ochraceae, 10 × 5–6 μ ; basidia spathulata, 23–25 × 10–12 μ.

Gregarious on tan in the propagating pits.

This fine species approaches *B. bulbillosus*, Fr., in the distinctly marginate bulb, differing however in its larger size, coarsely sulcate pileus, and white stem. Probably an introduced species.

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Tricholoma saevum, *Gillet.* (Figs. 14–16).

A species that has in all probability been passed over as a form of *T. personatum*, Fr., from which it differs in the fleshy pileus becoming plane, incurved margin glabrous from the first, absence of violet colour in the gills, and very short, stout, violet, squamulose stem.

Previously recorded from Sweden and France.

Among grass, Herbarium grounds.

Humaria pinetorum, *Fckl.* (Figs. 17–19).

This interesting fungus has been collected on fallen pine leaves in the Arboretum. G. Nicholson. Hitherto only recorded from Germany.

DESCRIPTION OF THE FIGURES.

BENTHAM TRUSTEES.

The Bentham Trustees obligingly supplied, free of cost, a limited number of copies of the plate. This is now exhausted.

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15. Section of pileus; nat. size.
16. Basidia and spores; × 400.
17. *Humaria pinetorum*, Fckl.; nat. size.
18. Single plant; × 8.
19. Free spores of same; × 400.

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VII.—MISCELLANEOUS NOTES.

Visitors during 1905.—The number of persons who visited the Royal Botanic Gardens during the year 1905 was 1,824,319. That for 1904 was 1,579,666. The average for 1895–1904 was 1,334,549. The total number on Sundays was 853,631, and on week-days 970,688. The maximum number on any one day was 61,183 on August 7, and the smallest 70 on December 11.

The detailed monthly returns are given below :—

January	29,876
February	34,310
March	64,825
April	166,910
May	245,714
June	302,427
July	345,996
August	286,542
September	234,183
October	65,347
November	25,253
December	22,936

MR. KENNETH GEORGE BURBRIDGE, a member of the gardening staff of the Royal Botanic Gardens, has been appointed by the Secretary of State for the Colonies, on the recommendation of Kew, Curator of the Botanic Station at Kumasi, Ashanti, a branch station recently established in connection with the Botanical and Agricultural Department of the Gold Coast.

MR. EDGAR W. FOSTER, formerly a member of the gardening staff of the Royal Botanic Gardens, and late Curator of the Botanic Station, Lagos, has been appointed by the Secretary of State for the Colonies, Assistant Conservator of Forests in the Colony.

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ROYAL BOTANIC GARDENS, KEW.

BULLETIN

OF

MISCELLANEOUS INFORMATION.

No. 3.] [1906.

VIII.—PLANT DISEASES.—IV. DISEASES OF BEET AND MANGOLD.

It is a common saying among horticulturists and others that long-continued cultivation of a particular species of plant makes it more susceptible to disease than is the case with the same kind of plant growing in a wild state. As a rule there is no real evidence in support of such an opinion.

Exhaustion of the soil is a favourite explanation of "beet-sickness," "clover-sickness," &c., but numerous exhaustive analyses of the soil have clearly demonstrated that the essential constituents of the soil have not been lacking; and, furthermore, the addition of fertilizers has not reduced the diseases alluded to. On the other hand, these diseases have been clearly traced to the direct action of animal or fungus parasites, and when these were removed the disease disappeared.

The following is an attempt to deal in an intelligible manner with some of the most destructive parasites attacking beet and mangold, accompanied by a description of the methods that experience has proved to be most effectual in checking the same.

Beet Canker.

(*Pionnotes betae*, Sacc.)

This fungus sometimes destroys stored beet and mangold, especially if sweating has occurred. Small scattered glairy, dingy yellow spots first appear on the surface of the root; these soon spread and run into each other, forming irregularly shaped, nodulose, subgelatinous crusts up to one and a half inches across, varying in colour from ochraceous to orange.

Owing to the cells of the beet being disorganised and used up by the mycelium of the fungus large cavities are formed, and, aided by myriads of bacteria, the root soon becomes watery and rotten, at the same time exhaling a very unpleasant odour. Adjoining roots are quickly attacked, and if the disease appears soon after the beet are stored a large percentage is often lost.

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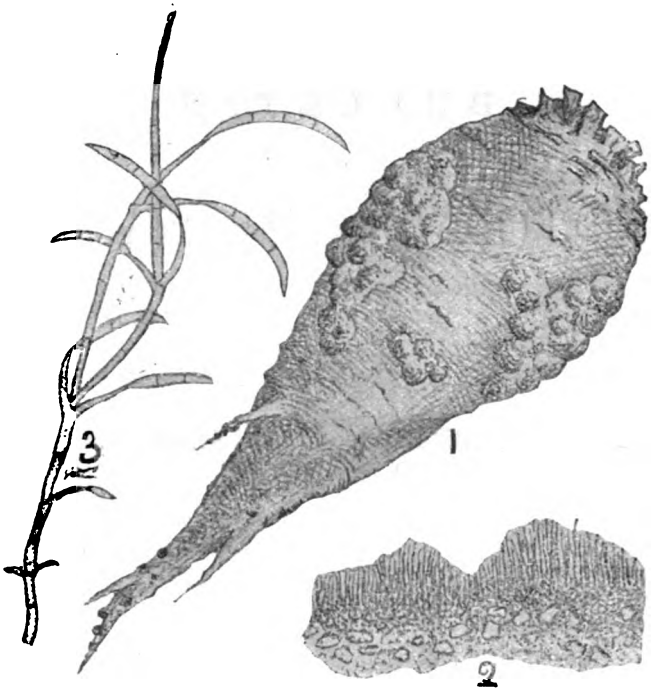


FIG. 1.—Beet canker. 1, appearance of a diseased beet; 2, section through a diseased wart; 3, fruit of the fungus; 2 and 3 highly magnified.

In some few instances I have detected this fungus on beet that have not yet been lifted.

The substance of the fungus consists of a dense mass of slender threads or hyphæ imbedded in a glairy substance, the whole forming a subgelatinous crust two to three lines thick. When mature the entire surface of this crust is covered with a dense mass of colourless, narrowly spindle-shaped, slightly curved three-septate conidia. These conidia germinate quickly on a moist surface when mature; a small number on the point of a lancet inserted into the flesh of a perfectly healthy beet formed a disease-patch one inch across in 11 days.

This fungus also attacks potatoes, as I have proved by repeated inoculation experiments, and it is probable that the frequent cases of rotten stored potatoes is caused by the parasite under consideration, which, judging from the description given, appears to be identical with the fungus called *Pionnotes rhizophila*, Sacc., said to attack potatoes and dahlias.

Preventive measures.—Great care should be taken not to include roots showing symptoms of the disease when storing; furthermore, the roots should be thoroughly dry, so as to avoid any possibility of sweating in the pit. From personal observation, also from information, I find it appears to be a common practice when removing stored roots to either leave diseased specimens on

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the ground to rot and disappear, to take them to the piggery, or to throw them on to the manure heap. All methods are equally unsatisfactory, as the mycelium and conidia present continue to grow, and being spread far and wide endanger future crops. The only safe method of dealing with such diseased material is to bury it without delay.

Beet Rust.

(*Uromyces betae*, Kühn.)

This fungus occurs on mangold and beet, also on wild beet (*Beta maritima*), and when present in quantity the crop is considerably reduced owing to the destruction of the leaves, whereby the root is arrested in its growth, and the amount of sugar considerably lessened.

The three stages in the life-cycle of the fungus are all produced on the same plant. The aecidium or "cluster-cup" condition appears in spring on the leaves and leaf-stalks under the form of minute cavities or cups with white torn margins, which are usually arranged in groups on a pale spot. The cups when mature are filled with yellow spores. Other minute bodies called spermogonia, whose use is unknown, precede or accompany the aecidia.

The aecidiospores, scattered by wind, rain, or the movements of animals, are deposited on other leaves of the host, where they germinate, enter the tissue, and in a short time give origin to numerous minute warts that burst when mature, and liberate little heaps of brown uredospores, which are often so abundant as to give to the surface of the leaf the appearance of having been sprinkled with snuff.

It is this uredospore stage that does the damage to the crop. The uredospores are produced in immense numbers, and are capable of germination at once, are dispersed wholesale, and infect the crop with great rapidity when conditions are favourable, the requirements being moisture on the surface of the leaves and some means of spore dispersion.

Later in the season the teleutospores, representing the third form of spore produced by the fungus, are formed in small clusters on the leaf-stalks, or sometimes along with the uredospores. The teleutospores remain in an unchanged condition until the following spring, when they germinate and infect the leaves of young beet plants, giving origin to the aecidium stage of the fungus.

Preventive measures.—Removing the leaves bearing aecidia or "cluster-cups" is effective, as the aecidiospores give origin to the uredo stage, which, as already stated, is the condition that does the real damage to the crops. Where hand picking is out of the question, on account of the large quantity grown, spraying on the first appearance of the disease with dilute Bordeaux mixture or with a solution of potassium sulphide will check the spread of the disease.

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The disease is not present in the seed, although its early appearance on seedlings has led some to suppose this to be the case. The crop always commences perfectly free from disease, and its appearance is due to the plants having been infected by teleutospores formed during the previous autumn. Rotation of crops does much towards guarding against the disease. If beet or mangold be sown on ground that produced a diseased crop the previous season infection is almost certain to result, since, however much care may be exercised in removing all diseased leaves, numerous teleutospores are certain to fall to the ground, where they remain unchanged until the following crop is ready for infection. It is therefore advisable not to grow the same crop for two years in succession on the same ground.

Badly diseased beet-leaves are injurious to stock, and even if this were not the case it is perfectly certain that when such leaves are placed in the piggery, or given to cattle, myriads of teleutospores in a condition for germination are placed on the land along with the manure, and a diseased crop is the result. The safest, and in the end the most economical method is to collect all diseased "tops" that are twisted off when the roots are lifted and bury them; the small amount of fodder or manure so sacrificed is certainly much less than the risk—almost a certainty—of having an infected crop the following season.

Leaf Spot.

(*Cercospora beticola*, Sacc.)

Probably the most destructive leaf disease to which beet and mangold are subject. The first external indication of the fungus is the presence of numerous minute, roundish pale spots on the leaves and leaf-stalks. These spots continue to increase in size for some time, becoming irregular in shape, and often run into each other, forming large irregular blotches which are pale at first, and often bounded by a dark line; eventually these blotches, which show on both sides of the leaf, become darker in colour, and the entire leaf becomes almost black, shrivels, and dies.

If a diseased spot is examined under a magnifying glass very minute erect hair-like bodies are seen on the surface, and under the microscope these tufts are seen to consist of clusters of pale brown fungus-threads or conidiophores, each bearing one or more long, slender reproductive bodies or conidia. These conidia are dispersed at maturity and infect neighbouring plants. It is stated that those conidia that are carried to the ground by rain or on fallen diseased leaves remain alive during the winter and infect young beet plants the following season.

As a rule the plants are not killed outright by this disease, but the growth of the root is checked, hence the total yield is reduced. From the evidence afforded by analysis Professor Pammel, an American vegetable pathologist, remarks as follows in regard to sugar beet:—"I think it is safe to say that the amount of sugar in the beet itself is scarcely diminished. The loss comes mainly from a smaller amount of the total product."

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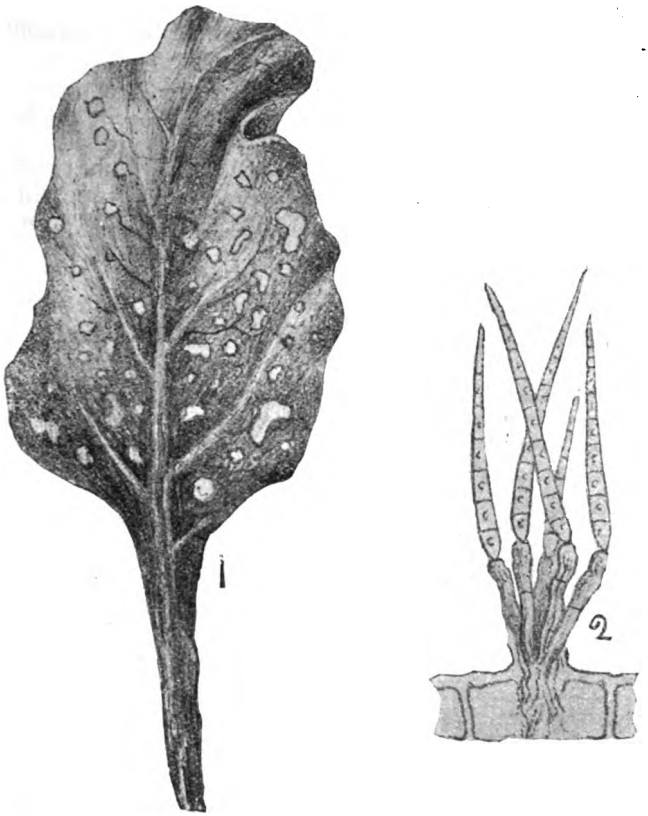


FIG. 2.—Leaf spot. 1, appearance of a diseased leaf; 2, fruit of the fungus, highly magnified.

Preventive measures.—Spraying with Bordeaux mixture checks the disease if operations are commenced on the first appearance of the fungus. The following results of this method are recorded in the New Jersey Agric. Coll. Expt. Station Report, 1896 :—"The foliage of the bordeauxed plots was not materially injured, and when harvested showed an increase in weight over the average of the two checks of 77·5 per cent. The root systems of the sprayed plot showed a corresponding increase of 46·5 per cent."

Diseased leaves should not be allowed to decay on the ground, otherwise the conidia present would be likely to inoculate a succeeding crop.

BEET MILDEW.

(*Peronospora Schachtii*, Fuckel.)

The young heart-leaves of beet and mangold are frequently attacked by this fungus, which, when present in quantity, often kills the plant when favoured in its development by damp

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weather. Its extension is checked by a spell of dry weather but even under those circumstances plants that have been attacked contain but a small amount of sugar.

The fungus appears as a very delicate lilac-coloured mould, which frequently covers the entire under surface of the leaf, and in some instances appears also on the upper surface. Infected leaves are readily recognised by being deformed and twisted, and by the presence on their under surface of the mould, which consists of a dense forest of slender threads emerging through the

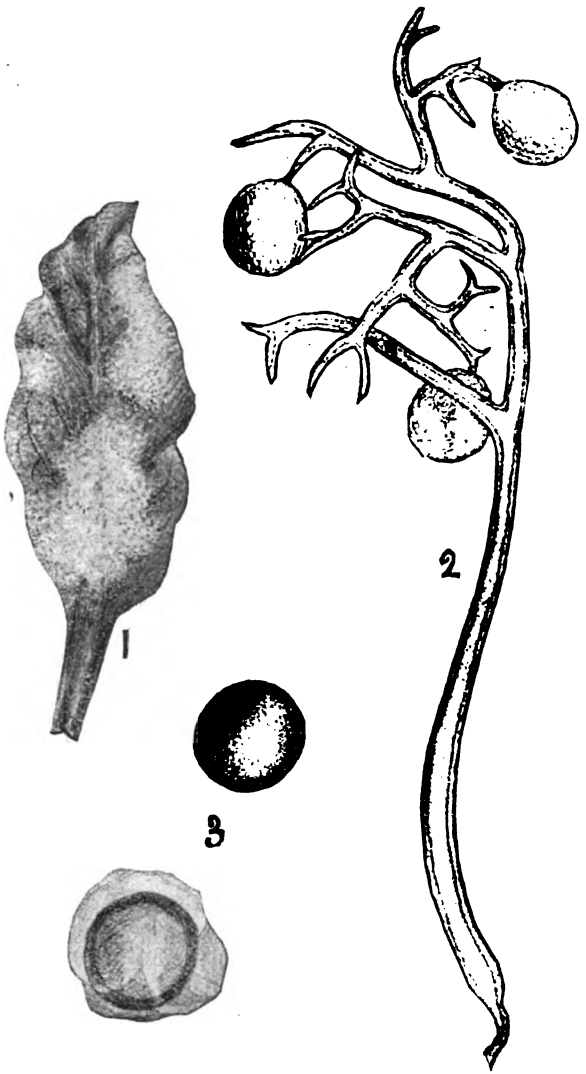


FIG. 3.—Beet mildew. 1, appearance of a diseased leaf; 2 summer fruit of the fungus; 3, resting spores of the fungus; 2 and 3 highly magnified.

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stomata, each thread being much branched at its tip, and each branch bearing a minute elliptical conidium or reproductive body. These conidia are carried by wind or washed by rain from one leaf to another, where they germinate, and soon form a new centre of disease, from which conidia are liberated in rapid succession and in great numbers. In addition to the surface mould other bodies called oospores are formed on the mycelium of the fungus present in the tissues of the leaf. These bodies are carried to the ground by the decaying leaves, where they remain unchanged until the following season, when they germinate, and if beet or mangold be present the plants are infected.

Preventive measures.—Avoid sowing beet or mangold on ground that has produced a diseased crop of the same kind the previous season; in fact it is not good policy under any conditions to attempt two root crops on the same land in succession.

It has been suggested that when plants have been attacked by the fungus and have afterwards recovered, the mycelium hybernates in the neck of the root, and appears the following season, producing a crop of conidia; it is therefore important not to plant roots for the purpose of producing seed that were grown in an infected area.

If the disease appears among young plants, spraying with dilute Bordeaux mixture will arrest the spread of the fungus.

Violet Root Rot.

(*Rhizoctonia violacea*, Tul.)

This very destructive disease is recognised by the presence of a more or less dense violet or brownish-coloured mould on the roots. The life history of this fungus has not been followed; several species have been proposed; but as suggested by Tulasne, a French mycologist, probably all are forms of one species. When young plants are attacked they usually die gradually, whereas when the root is fleshy death is somewhat sudden; large holes are formed in the flesh, the surface being covered with the brown mycelium of the fungus. Numerous small dark-coloured sclerotia or compact masses of mycelium are also usually formed in the decaying tissues of the host; these are liberated in the soil, and enable the fungus to continue its existence from year to year.

The disease occurs in patches in the field, which continue to increase in size. A single beet is first attacked from which the mycelium spreads in the soil, attacking in turn neighbouring plants. Owing to the great number of different kinds of plants on which the fungus can live, it is very difficult to eradicate when it has once gained a foothold. Carrots, turnips, potatoes, lucern and saffron are all attacked. It has been stated that saffron and potatoes have been attacked after an interval of twenty years' rest from such crops on land that had previously produced a diseased crop. Spores or special reproductive bodies are unknown, the fungus reproducing itself from year to year by means of its mycelium and sclerotia. It is very probable that the fungus derives food from various weeds as well as from cultivated plants.

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Preventive measures.—Good cultivation, alternation of crops and destruction of weeds afford the only means of successfully combating the disease, which fortunately does not attack cereals.

Beetroot Tumour.

(*Urophylictis leproides*, P. Magn.)

This disease was first observed attacking beetroot growing in the grounds of the School of Agriculture, Rouiba, near Algiers.

The disease is characterised by the presence of one or more brain-like outgrowths or tumours, each attached by a narrow neck

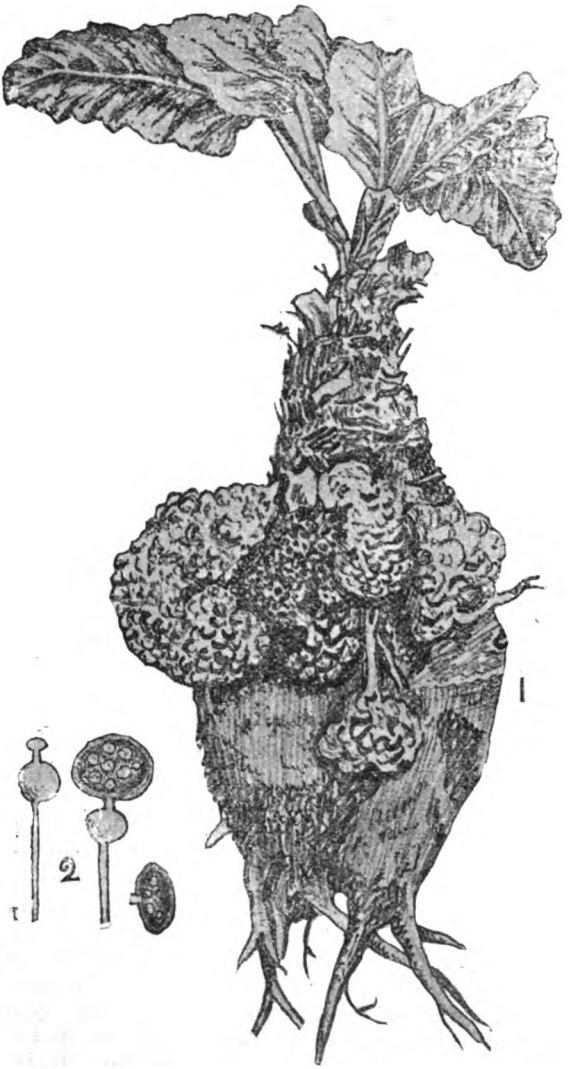


Fig. 4.—Beetroot tumour. 1, appearance of a diseased beet; 2 spores of the fungus, highly magnified.

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to the upper part of the beetroot, and originating from rootlets or leaves that are inoculated by the fungus, which in the first instance enters an epidermal cell causing it to swell, and subsequently promoting rapid division and multiplication of surrounding cells, until eventually an irregularly formed mass of tissue results. When fully developed these outgrowths attain a large size, and when cut open present a cavernous or spongy appearance inside, the cavities being filled with masses of dark brown, thick-walled resting-spores, resulting from the conjugation of male and female cells, borne on distinct hyphæ or strands of mycelium.

The mature resting-spores are large, with a smooth, thick, dark brown wall, elliptical, and are produced at the tips of very slender hyphæ which have a globose, colourless swelling just below the insertion of the resting-spore.

Quite recently, the fungus under consideration, or one very closely allied, has attacked potatoes in this country, causing coarse, scabby outgrowths on the surface of the tubers.

Preventive measures.—Diseased plants should be removed and burned the moment they are observed; if allowed to remain and rot on the ground, the liberated resting-spores would endanger future crops.

White Rust.

(*Cystopus bliti*, De Bary.)

This fungus has only hitherto been observed on sugar-beet in one locality in the United States, but as allied species often prove destructive to other plants, especially those belonging to the Cruciferæ, such as cabbage, radish, horse-radish, &c., it is possible that the mangold and beet may also suffer when attacked under conditions favourable for the rapid extension of the parasite.

The disease is indicated by the presence of pure white shining slightly raised spots about one line across on both surfaces of the living leaves. These patches constitute the conidial or summer form of fruit, and are developed below the epidermis of the leaf, which becomes ruptured when the spores are mature. The spores germinate quickly when placed in water or on a damp surface; hence those that are washed by rain or blown on to the surface of a damp leaf soon give origin to a new rust pustule, which in turn liberates spores.

Resting-spores or oospores are also formed on the mycelium of the fungus present in the tissues of the leaf; these remain in an unchanged condition until the following spring, when they germinate, and if young beet or mangold happen to be present, inoculation follows and the conidial condition of the fungus is the result.

Preventive measures.—No experiments have been made with the fungus growing on beet, but the allied species—*Cystopus candidus*—infesting crucifers, is known to attack plants only during the seedling stage, and if the same rule holds good in the present instance, diseased plants could be removed when the young plants are thinned out. Old diseased leaves should not under any circumstances be allowed to remain on the ground,

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neither should they be given to cattle, on account of the risk incurred of carrying back to the field living resting-spores in the manure.

Beet-sickness.

(*Heterodera Schachtii*, Schm.)

This most destructive disease of sugar-beet is caused by a minute nematode, better known by the name of eelworm, on account of its shape and wriggling movement when seen under the microscope. It is only the larval or young condition before sexual differentiation and the males that are eel-shaped; the females are lemon-shaped, sluggish, and generally located in the

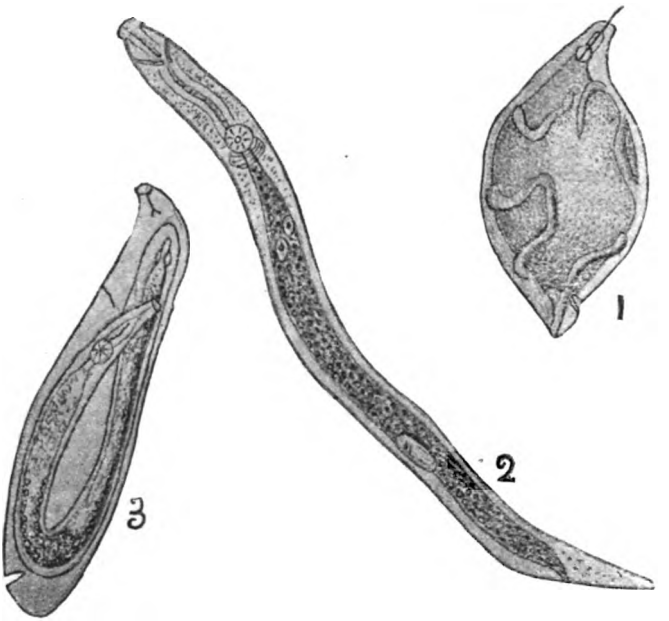


Fig. 5.—Beet sickness. 1, female eelworm; 2, male eelworm; 3, young eelworm yet in the egg; all highly magnified.

small lateral rootlets, where they form whitish warts about the size of a pin's head. The encysted female contains from two to three hundred eggs, which are hatched before leaving the body—in other words, the nematode is viviparous.

During the larval condition the eelworms, after wandering for some time in the soil, penetrate into the tissues of the beet, which are subsequently destroyed.

When a beet is attacked by eelworms the leaves become flabby, yellow, and soon die, the top of the root changes to a blackish colour, and soon the whole decays.

In addition to sugar-beet, *Heterodera Schachtii* attacks mangold, the roots of cereals, many cruciferous plants, as turnips, rape, cabbage, &c.; also some leguminous plants, and probably weeds of various kinds.

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The beet eelworm has hitherto been mostly observed in Germany and France, but recently it has been recorded by Professor Percival as attacking the roots of the hop in Kent, causing the disease known as "nettled-headed" hops.

Preventive measures.—When land is once infested with eelworm the growth of susceptible crops is impossible, and, notwithstanding the numerous experiments extending over many years made by experts, more especially in Germany, no definite cure is as yet known. The most effective means of partially clearing the soil of the pests, so that a fairly successful crop may be secured, first suggested by Kühn, a German expert, consists in making use of a "trap crop." Summer rape is found most useful on account of its quick growth and large spread of root, which is readily attacked by the eelworms. Success in this direction depends on the prompt removal of the rape when a great number of the larval nematodes have entered the roots, and before a new brood is produced. Lime and salt have also proved of value in diminishing the number of parasites.

Beet and Potato Scab.

(*Oospora scabies*, Thaxter.)

American vegetable pathologists have demonstrated that the fungus causing potato scab also attacks beet. As potato scab is by no means uncommon in this country, it is very probable that beet and mangold may also be attacked.

The fungus presents a very primitive type of structure, and suggests affinity with the bacteria. It forms rough patches or scabs on potatoes, which are covered with a very delicate grey mould when just dug up, but the mould soon disappears when the potatoes become dry on the surface by exposure to the air. The fungus is capable of supporting itself in the soil when once introduced, consequently a crop becomes diseased if planted in infected soil.

Lime, farmyard manure, ashes, and all substances of an alkaline nature favour the development of the fungus, whereas its growth is arrested by acids.

Sulphur has proved to be the most effective preventive against scab in the case of potatoes, used at the rate of 300 lbs. per acre in the powdered condition, and sown in the drills.

Preventive measures.—Beet or mangold should never follow potatoes, especially if scab is known to have existed.

Heart Rot.

(*Sphaerella tabifica*, Prill. & Del.)

This disease usually manifests itself in August, when the roots have attained to a fairly large size. The first indication of its presence is the drooping of the large outside leaves in a manner similar to that caused by a very hot, dry day, but it will be observed that the leaves have not regained their normal position during the night, and, in fact, never do so. Careful observation of such drooping leaves shows that a considerable portion of the

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upper surface of the leaf-stalk presents a bleached appearance, the white portion being bordered by a brown line, and studded with very minute blackish points. These dark points represent one form of fruit of the fungus causing the disease, and before their true nature was known received the following names—*Phoma betæ*, Frank, and *Phoma tabifica*, Prill. & Del.

The mycelium of the fungus present in the leaf-stalks grows downwards until it enters the crown of the root, which is eventually killed; consequently the heart-leaves also perish, the fungus gradually extending into the root, where it is usually aided in the work of destruction by other forms of fungi, bacteria, eelworms, &c.

Later in the season a second form of fruit—the ascigerous condition—appears on the dead leaf-stalks. Judging from analogy, the spores of this second form of fruit will remain in an unchanged condition until the following season, when they will germinate and endanger the crop.

Preventive measures.—The early stage of the disease is readily recognised by the drooping and yellowing of the leaves, and when these symptoms are observed such roots should be lifted, as by this means they can be saved before the fungus passes into the crown of the root. Diseased leaves should be collected and buried. If allowed to rot on the ground, or even if given to cattle, the risk of further disease is great.

In August, 1900, some Swede turnips grown in Scotland were referred to Kew for investigation, and were found to exhibit all the symptoms of "heart rot," the general appearance and species of parasite being identical with those seen in beet and mangold attacked by this disease.

Bacterial Disease of Sugar Beet.

The following features characterize a bacterial disease of sugar beet, said to be not at all uncommon in the State of Indiana, U.S.A.

Every part of the plant is affected, the large outside leaves droop and die early, and the heart-leaves become distorted and change to a yellowish-green colour. Externally the root shows no evidence of disease, but when cut open shows dark rings, which become darker when exposed to the air, sometimes becoming black after a short time.

Cunningham, Clara A., in Proc. Soc. Prom. Agr. Sci., 1898, pp. 141–143.

Summary.

Beet or mangold should not be grown two years in succession on the same ground; in fact, it is not good policy under any circumstances to grow two root-crops of any kind in succession.

Weeds should not be tolerated, as even when the same kind of crop is only grown at proper intervals its fungus parasite may be supported by weeds during the interval.

The above suggestions, as will be seen, are not new ideas, but resolve themselves into the two old rules—(1) rotation of crops; (2) clean land.

Geo. Massee.

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IX.—BOTANICAL INSTITUTIONS OF JAMAICA.

In the Jamaica *Handbook* for 1901 (pp. 395–400), an interesting account is given by Sir D. Morris, K.C.M.G., of the history of the botanical institutions of that island. As this document has not appeared in subsequent issues of the *Handbook* and is too valuable to be lost sight of, it is now reprinted in the *Bulletin* with the object of rendering it more generally accessible. This account is in some respects supplementary to that already published in the *Bulletin* (Addl. Ser. I., pp. 137–144) in 1898.

"Public Gardens and Plantations.

"This Department has charge of the following establishments:—

"1. *The Botanic Garden, Castleton*, in the parish of St. Mary, on the road connecting Kingston with Annotto Bay, 19 miles from Kingston and 11 from Annotto Bay, contains a large collection of tropical plants. The chief features are the palmetum and a collection of economic spice and fruit trees. Elevation 496 feet. Annual mean temperature 76.1° Fah.; average annual rainfall 113.29 inches for 26 years.

"2. *The Hill Gardens*, in the parish of St. Andrew, on the slopes of the Blue Mountains, about 20 miles from Kingston, by way of Gordon Town, lie in the centre of an immense district shortly to be opened up by means of driving roads.

"The Garden was first established by Sir J. P. Grant for experiments with Cinchona, which was so successfully grown that the Government realised about £17,000 by the sale of bark, until the price fell in consequence of the extensive plantations in India, Ceylon and Java.

"Vegetables have also been grown, and instructions given in their cultivation, so that they are now produced in large quantities by all the settlers round.

"There is a nursery for timber trees and an experimental Orange Garden has lately been established at about 3,700 feet.

"Olives, Fruit trees and Tea have been planted; Fodder plants grown; experiments made with the variety of Ramie known as China Grass, and other plants of economic interest, all of which will probably be largely cultivated when the driving roads are completed. Elevation 3,500 to 6,300 feet. Annual mean temperature at 4,907 feet, 62.6° Fah.; average rainfall 102.2 inches for 27 years.

"3. *The Hope Garden*, near the foot of the hills in the Liguanea Plains, 5 miles from Kingston, consists of about 220 acres. The inner portion is being laid out as a Geographical Botanical Garden. There are large nurseries containing about 70,000 plants, such as orange, cocoa, rubber plants, nutmeg, clove, mango, vanilla, cardamon, sarsaparilla, cinnamon, Liberian coffee, etc. Elevation, 700 feet. Annual mean temperature 71.6° Fah.; average rainfall for 17 years is 51.79 inches.

"4. *Kingston Parade Garden*, the public pleasure garden of Kingston, is kept up with shade and ornamental trees, flowering

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plants, and tanks for aquatics. Elevation 60 feet. Annual mean temperature 79° Fah.; average rainfall for 28 years is 35.16 inches.

"5. *Botanic Garden at Bath*, is the old Botanic Garden of the Colony, established in 1779; it is still maintained for the sake of its valuable trees and palms, though much reduced in size. Elevation 170 feet. Temperature 78° Fah.

"6. *King's House Garden and Grounds*, four miles from Kingston, contain about 177 acres, of which about 20 acres are kept up as an ornamental garden attached to the official residence of the Governor. Many valuable economic plants and fruit trees are also under cultivation, as well as the rarer tropical palms and orchids. Elevation 400 feet. Annual mean temperature 78.4° Fah.; average rainfall for 18 years is 48.20 inches.

"The history of this Department is intimately connected with the various vicissitudes through which the island has passed, and since 1774 it has had its periods of depression no less than those of comparative prosperity.

"Directly and indirectly during the last hundred years the Botanical Department has been the means of introducing and propagating some of the most valuable plants, now the sources of the staple products of the island, and its work in this respect is being strengthened and increased year by year.

"It is a striking fact that with the exception of pimento—'that child of nature'—and a few others of comparatively little value, most of the staple products of the island are derived from exotics or plants introduced from other parts of the globe. While on this subject it will be of interest to notice the simple, accidental, or more often direct influences by means of which valuable seeds and plants have been introduced into the island, the mere mention of the names of which is sufficient to recall the vast influences they have exerted for good on the welfare and prosperity of the country.

"The sugar cane though here in the time of the Spaniards was first cultivated by the English, by Sir Thomas Modyford in 1660 (*a*); but its most valuable varieties, the Otaheite and Bourbon canes, were introduced in His Majesty's ships by Captain Bligh as late as 1796. Coffee was introduced by Governor Sir Nicholas Lawes in 1718 (*b*). The mango, brought by Captain Marshall of Lord Rodney's squadron in 1782, was first planted in Mr. East's Botanic Garden (Liguanea), and is now one of the commonest trees in the island (*c*). The plentiful and free-growing logwood was introduced from Honduras by Dr. Barham, a Botanist, the author of '*Hortus Americanus*,' in 1715 (*d*). The beautiful akee was obtained by Dr. Thomas Clarke, first Island Botanist, from a West African slave ship in 1778 (*e*). The cinnamon came with the mango in Captain Marshall's ship in 1782, and was distributed from the Bath Garden by Dr. Dancer. The ubiquitous but graceful bamboo is also an

"(*a*) *Hortus Jamaicensis*, Vol. II., p. 205.
"(*b*) *Hortus Jamaicensis*, Vol. I., p. 226.
"(*c*) Bryan Edwards' *History*, 5th Ed., Vol. I., p. 257.
"(*d*) *Hortus Jamaicensis*, Vol. I., p. 465.
"(*e*) Bryan Edwards' *History*, 5th Ed., Vol. III., p. 379.

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exotic and owes its introduction to Mr. M. Wallen (*a*), who brought it from Hispaniola, and first planted it in the parish of St. Thomas-in-the-East (*b*). For the cherimoyer we are indebted to Mr. Hinton East, who introduced it from South America in 1786 (*c*); to Mr. East and his magnificent garden we also owe the jasmines and many species of lilies; many convolvuli; the oleander; the horse radish tree; numerous roses; the trumpet flower; monkey bread; the camellia; *Calla æthiopica*; the weeping willow; the mulberry tree; the *arbor vitæ*, and the sweet scented mimosa (*d*). Dr. Clarke, on his arrival as Island Botanist in 1777, brought with him the jujube tree; and the litchi; the purple dracæna; the sago palm and the valuable camphor tree; at the same time there came the now common 'almond' tree; the tea tree, and the 'sunn' hemp plant (*e*). The wanglo or zezegary was sent by Sir Simon Haughton Clarke in 1801 (*f*). The nutmeg tree, first brought by Lord Rodney in 1782, was re-introduced by Dr. Marter in 1788, together with the clove and black pepper, for which he received the thanks of the House of Assembly and an honorarium of £1,000. The seeds of the valuable and now indispensable Guinea-grass were accidentally introduced from the West Coast of Africa as bird food in 1745 (*g*). Scotch grass received its name from having been first brought from Scotland to Barbados.

"Pindars were brought to Mr. East from South America; the afou, the acom and Guinea yam, and indeed all but one of the cultivated yams are from the Coast of Africa or East Indies (*h*). The seeds of the guango were brought over from the mainland by Spanish cattle (*i*). Cacao is indigenous to Central America. The shaddock was brought to the West Indies from China by Captain Shaddock, hence its name (*j*). The genip was brought to Jamaica from Surinam by one Guaf, a Jew. The ginger is a native of the East Indies, introduced to Jamaica by a Spaniard, Francisco de Mendiza. The locust tree and blimbing were brought to Jamaica from the South Seas in His Majesty's ship Providence in the year 1793. The orange, both sweet and seville, the lime, the lemon and citron, were brought hither by the Spaniards. The Jerusalem thorn is from the Spanish Main (*k*). The prickly pear is a Mexican plant.

"(*a*) Bryan Edwards' *History*, 5th Ed., Vol. III., p. 371.

"(*b*) To Mr. Wallen, formerly owner of Cold Spring and Wallenford, the friend of Swartz and a successful botanist, we are, no doubt, indebted for the first plants of the water-cress, chick-weed, wild pansy, groundsel, dead nettles, dandelion, common honey-suckle, black-berried elder, evening primrose, nasturtium, common myrtle, the English oak, white clover and the sweet violet, now common on the Port Royal and Blue Mountains, being, possibly, escapes from his garden at Cold Spring, which even in 1793 was well stocked with choice selections of introduced flowers and European trees and shrubs. Bryan Edwards' *History*, 5th Ed., Vol. I., p. 243.

"(*c*) Bryan Edwards' *History*, 5th Ed., Vol. III., pp. 367–407.

"(*d*) Bryan Edwards' *History*, 5th Ed., Vol. III., pp. 367–407.

"(*e*) Bryan Edwards' *History*, 5th Ed., Vol. III., pp. 367–407.

"(*f*) *Journals Assembly*, Vol. X., p. 638.

"(*g*) *Hortus Jamaicensis*, Vol. I., p. 353.

"(*h*) *Hortus Jamaicensis*, Vol. II., p. 310.

"(*i*) *Macfadyen Flora*, Vol. I., p. 308.

"(*j*) *Macfadyen Flora*, Vol. I., p. 131.

"(*k*) Trans. Roy. Soc. Arts, Jamaica, Vol. I., p. 114.

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"Returning, however, to the history of the Department under review, it appears that the first public Garden established in the island was the old Botanic Garden at Bath; and in the *Journals of the House of Assembly*, Vol. VIII., 1784–91, p. 602, mention is made of Dr. Thomas Clarke, 'Practitioner in Physic and Surgery,' who came to the island in 1777, at the particular instance and request of the late Sir Basil Keith, to superintend two Botanic Gardens, then intended to be established in the island. One was to be a European Garden, which however, was not established till long after, at Cinchona, and the other was the 'Tropical Garden' at Bath.

"A private garden possessing many rare and valuable plants had already been formed by Mr. Hinton East in Liguanea (Gordon Town) which, on the death of the founder, became the property of his nephew, Mr. E. H. East, 'who with great generosity offered it to the Assemby of Jamaica for the use of the public at their own price.'

"Mr. Bryan Edwards, in the *History of the British West Indies*, remarks that 'the Assembly of Jamaica, co-operating with the benevolent intentions of His Majesty (to introduce valuable exotics and productions of the most distant regions to the West Indies), purchased in 1792–93 the magnificent Botanical Garden of Mr. East and placed it on the public establishment, under the care of skilful gardeners, one of whom, Mr. James Wiles, had circumnavigated the Globe with Captain Bligh.'

"An interesting catalogue of the plants in this Garden, at the time of Mr. East's decease, was prepared by Dr. A. Broughton, and forms an appendix under the title of 'Hortus Eastensis' to Bryan Edwards' *History of the British West Indies*, Vol. I., p. 475. From it we gather that as early as 1782 the mango, akee, cinnamon, camphor, jack tree, bichy or kola, date palm, rose apple, litchi, turmeric and many valuable plants, numbering nearly 600, had already been introduced into the island and were becoming thoroughly acclimatised.

"From a letter addressed to Sir Joseph Banks by the Botanic Gardener, Jamaica, 1793, we gather that the bread fruit trees* 'were upwards of 11 feet high, with leaves 36 inches long, and the success in cultivating them has exceeded the most sanguine expectations; the cinnamon tree is become very common, and mangoes are in such plenty as to be planted in the negro grounds. There are, also, several bearing trees of the jack or bastard bread fruit . . . and we have one nutmeg plant.'

"The Botanic Garden at Liguanea (as it was called) continued to be under Mr. Wiles' care (superintended by a Committee of the House of Assembly) for many years, while that at Bath was entrusted to Dr. Dancer as Island Botanist. The allowance for the two Gardens was fixed at £800. The duties of the Island Botanist were defined as follows: 'To collect, class and describe the native plants of the island; to use his endeavours to find out their medicinal virtues; to discover if they possess any qualities

"* For his services in introducing the Bread Fruit tree 1,000 guineas were granted in 1793 to Captain Bligh and 500 guineas to Lieutenant Portlock.

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useful to the arts, and annually to furnish the House with a correct list of such plants as are in the Botanic Gardens, together with such information as he may have acquired relative to their uses and virtues.'

"For the purpose of distributing the bread fruit and other valuable plants from the Botanic Garden the Committee of the House 'appointed several Committees for each county, to receive and distribute the allotments destined for them,' and, according as sufficient numbers were prepared for propagation, the Chairmen of the County Committees were apprised and their respective proportions delivered and distributed, 'by which means,' it is quaintly remarked, 'the public has derived all the advantages to be expected from these establishments.'

"During the years 1791–1807 the Committee in charge of the Botanic Gardens, with Mr. Shirley as Chairman, greatly developed and improved them. Inquiries were made everywhere for new products; thanks and gratuities were voted for the introduction of valuable plants; and these were cultivated and distributed with great assiduity and care. In order to make the island less dependent on America for supplies every encouragement was given to the cultivation of yams, cocoes, maize, plantain, and such products as the bread fruit, zezegary or wanglo, nutmeg, clove, cinnamon, pindars and coffee, it being believed that the 'cultivation of these valuable exotics will, without doubt, in a course of years lessen the dependence of the Sugar Islands on North America for food and necessaries; and not only supply subsistence for future generations, but, probably, furnish fresh incitements to industry, new improvements in the arts, and new subjects of commerce.'(*a*)

"These beneficial efforts, long and successfully maintained, were however greatly relaxed after the year 1807, and under the influence of domestic trouble, want of due appreciation of the value and nature of Botanic Gardens, or the need of strict economy, a bill was introduced into the House of Assembly in 1810, 'for vesting the Botanic Garden in Liguanea in the Commissioners of the Board of Works, to be sold and the money to be brought to the credit of the public.' This bill was finally passed, December, 1810, and, the Garden passing to private hands, many of the valuable plants contained in it, and collected with so much care and industry, were entirely lost. (*b*)

"The Garden at Bath was however maintained, though in a very reduced state. Dr. Stewart West acted for some time as Island Botanist and was engaged in collecting the plants that had been lost from the Gardens, for the purpose of propagating and distributing them.

"In the year 1824 an effort was made to restore the value and usefulness of the Botanic Gardens, and Sir M. B. Clare, from the Committee appointed to inquire into the state of the Botanic

"(*a*) Bryan Edwards' *History*, 5th Ed., Vol. I., p. 12.

"(*b*) The land formerly occupied by the Botanic Garden in Liguanea has become the property of the heirs of Mr. Geo. Henderson. Gordon Town is still known as "The Gardens."

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Garden, reported: 'That the Botanic Garden in St. Thomas-in-the-East, established more than 50 years ago, has during that period received and transmitted for propagation throughout the island many valuable plants. That the Royal munificence of his late Majesty promoted the object of this institution by vessels-of-war employed to collect plants in the settlements of the east and south seas, some of which are now naturalized in this island, and more might be added, greatly to the advantage of its inhabitants. Your Committee, therefore, recommend that proper care may be taken to preserve the valuable plants which the Garden now contains. That in addition to the above considerations, your Committee are of opinion that one object of this institution of chief importance has never been properly attended to, namely, the investigation of the many unknown native plants of this island, which, from the properties of those already known, it is reasonable to infer would prove highly beneficial in augmenting our internal resources, by supplying various articles either for food, for medicine, or for manufactures, to be cultivated, prepared and exported as staple commodities, by which great commercial advantages might be obtained; among others the various vegetable dyes claim particular attention as promising a fruitful field for discovery. That it appears to your Committee that the person fit for undertaking such inquiries ought to be a well educated and scientific man, combining with his botanical knowledge sufficient information in experimental chemistry to enable him to discover the useful qualities of such indigenous plants, and improve the productions of those already known; but at the same time your Committee strongly recommend that such person should not be a medical man, as his whole time and attention ought to be applied to promote the above objects. Your Committee recommends to the House to instruct the Commissioners of Correspondence to direct the Agent to apply for such a person to the President of the Linnean Society in London.' As a result of this proposal Mr. James Macfadyen was selected and approved of as a Botanist, and arrived in the island in 1825.

"At the same time it was felt that the Botanic Garden at Bath was too distant from Kingston and the seat of government to answer the intention proposed, and it was recommended that a bill be brought in for purchasing a proper place for such a Garden in the vicinity of Kingston and Spanish Town.

"This proposal was, however, never carried into execution, and the Garden at Bath, on the removal and death of Mr. Macfadyen, 'fast falling to decay,' was placed in charge of Mr. Thomas Higson; and his petitions addressed to the House of Assembly during 1830–32 shew that the allowances made were not sufficient for the maintenance of the Garden even in its reduced state, and that no remuneration had been made to him for its superintendence.

"In 1833, in another fit of economy, owing to domestic troubles and the need for retrenchment, a Committee was appointed to 'report on the best means of diminishing the contingencies and expenditure of the island and to consider whether the Botanic Gardens at Bath could be sold for the benefit of the public.'

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The report was made at the close of the year and ordered to lie on the table. Nothing further, however, appears to have been done for the Garden till 1840, when the sum of £300 was 'voted for the improvement of the Garden at Bath and for the services of a Botanist.' This sum, afterwards reduced to £200, was placed in the hands of the members of St. Thomas-in-the-East, Portland and St. David, by whom it appears to have been administered down to the year 1852, when the Garden was transferred to the Board of Directors of the Bath of St. Thomas the Apostle. The late Mr. Nathaniel Wilson was appointed Curator of the Garden in 1847, and devoted many years, often labouring under great discouragements, in maintaining and improving the Garden and introducing new plants. His yearly reports contain sufficient evidence of the value of the Garden, small as it was, to an island entirely dependent for its prosperity on its agricultural interest; and assisted and encouraged by the Rev. Thomas Wharton, Mr. Wilson laboured most successfully in the propagation and distribution of valuable plants, and especially in developing the 'fibre' resources of the colony.

"In 1857 a grant was passed by the Legislature for purchasing land for a Botanic Garden at Castleton, in the parish of St. Mary, 19 miles from Kingston, and steps were at once taken to establish the Garden and remove such plants as could be spared from Bath.

"Writing in 1861 Mr. Wilson referred to the successful introduction of seeds of the valuable cinchona tree to Jamaica, 'through the liberality of the British Government and recommendation of Sir W. J. Hooker of Kew.' By the month of October, 1861, Mr. Wilson reported that he had 'over 400 healthy plants quite ready for planting out.' As the climate of Bath was unsuitable for the successful growth of cinchona, by the kindness of the late Dr. Hamilton, they were tried at Cold Spring Coffee Plantation, St. Andrew, at an elevation of 4,000 feet. Here Mr. Wilson found 'the climate and soil to be all he could desire, and as it afforded every facility for carrying out so valuable an experiment he at once availed himself of it, and planted out in the coffee fields, on the 16th November, 1861, several plants of each species, then about 2 and 2½ inches in height. In twelve months after a plant of the red bark (*Cinchona Succirubra*) had attained to the height of 44 inches, with leaves measuring 13½ inches long by 8¾ inches broad. The same plants in December, 1863, *i.e.*, when two years old, measured six feet in height, with 10 branches, having a circumference of stem at a base of 4½ inches.

"In 1862–63 a grant was made for the salary of an Assistant Gardener to Mr. Wilson, and Mr. Robert Thomson, formerly of Kew, received the appointment.

"The Garden at Castleton was then finally established and ultimately, by the influence of Sir John Peter Grant, the Government Cinchona Plantations were opened in 1868, and placed under the management of Mr. Thomson, who, on Mr. Wilson's retirement, had been appointed Superintendent of the Botanic Gardens.

"The export of cinchona bark from the Government Plantation to the 30th September, 1884, was 73,533 pounds of the value of £16,327. There was no exportation in 1885. A consignment

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of 150 bags of various qualities was despatched to London in December, 1886. The bark weighed 17,009 pounds and was sold for £542 9*s*. There has been no export since that time.

"Mr. Thomson retired on pension in 1878, and in December, 1879, the Department was placed under the Directorship of Mr. (now Sir) D. Morris. After the appointment of Mr. D. Morris in 1886 as Assistant Director of the Royal Gardens, Kew, the Department was placed under the charge of the present Director, Mr. W. Fawcett, of the Natural History Department of the British Museum.

"In the report of the Royal Finance Commissioners this Department is mentioned as follows :—

"'In a purely agricultural country like Jamaica a well organized Department of Gardens and Plantations is invaluable, not only for introducing and propagating such plants as are most suitable to the climate and soil, but also for the dissemination of the knowledge requisite to cultivate the products of the island to the best advantage. We found that this Department has done good work, and the public appreciation of the opportunities afforded by it is spreading fast.'

"The Department of Public Gardens and Plantations issues a Monthly Bulletin, affording information 'on cultural industries, and on the diseases of plants, on soils, and on native plants.' The Bulletin is supplied free of cost to residents in the Island, and is a most useful agent in the dissemination of information among all classes."

X.—BAMBARRA GROUND-NUT.

(*Voandzeia subterranea*, Thon.)

Bambarra, a district on the Upper Niger near Timbuctoo, has in our language given its name to this African ground-nut. Cultivated throughout Tropical Africa from the Sahara to Natal, Bambarra has no pre-eminent claim to the plant, which bears a great variety of native names in different parts of the continent. On the Guinea Coast it is aquing or jubbejubbe, in Bornu mgangala, in Angola viélo, in Unyoro mpande, about Kilimanjaro puo, in Nyasaland litlo. On the Mozambique coast where *Arachis* is called mjugu nyasa, *Voandzeia* is mjugu mawa (mawa=a stone, from the hardness of the seeds, see Grant in *Trans. Linn. Soc.* xxix., p. 8); in the Transvaal it is tindlohu and in Natal inhlubu.

There is no trade in Bambarra ground-nuts, save to a small extent at Zanzibar (see *K.B.*, 1892, p. 88), only the hard starchy seeds are eaten wherever grown, the natives supplying their own needs. In German South-west Africa (see Warburg, *Tropenpflanzer*, iii., p. 169) and in the region of the great lakes this is particularly the case.

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It is a mistake to count the nut among African oil-seeds, for as the following analysis by Dr. Thom (*Tropenpflanzer*, l. c.) indicates, the proportion of oil present is insignificant :—

Water	10·20
Oil	4·53
Nitrogenous matter	19·20
Starch	49·91
Phosphoric acid	0·80
Ash	5·13
	89·77

Dr. Thom does not account for the loss of over 10 per cent., but at the same time he does not give any figure for fibre, cellulose, &c., to which presumably the percentage omitted belongs.

In a note by Balland (*Comptes rendus*, cxxxviii., p. 1061) another analysis is given which corroborates the low percentage of fatty matter obtained by Thom. Balland's results are :—

Water	9·8
Fatty matter	6·0
Nitrogenous matter	18·6
Starch	58·3
Cellulose	4·0
Ash	3·3
	100·0

Balland's sample of this Ground-nut, which came from Bangasso in Upper Ubangi, was exhibited at the Paris Exposition among the products of the French Congo as *Haricot-Pistache.*

Voandzeia subterranea, the only species of the genus, is undoubtedly a native of Africa, despite the statements of Linnaeus and the botanists who preceded him to the effect that it comes from South America. Schweinfurth and Ascherson (*Aufzahlung*, p. 259) record it as wild on the Upper Nile, and it is stated to be both wild and in cultivation in Senegambia (Guillemin, Perrottet and Richard, *Floræ Senegambiæ Tentamen*, p. 254).

There are several forms in cultivation, differing from one another in the colour and hardness of the seeds. These seeds are about the size of a pea, at times of a pale yellow with a black hilum or point of attachment, at times mottled and ranging through all shades to a very dark brown. Soaked for a night in water and then boiled they are said to form an excellent vegetable. It is further stated (Taubert in Engler *Pflanzenwelt Ost-Afrikas*, B., p. 123) that the red-brown or nearly black seeds become palatable with less cooking than those which are pale in colour or mottled. The younger they are the more pleasant and sweet they taste. They are boiled or fried in butter or oil, or sometimes pounded into a meal. Headaches are said to result from too free a use of them.

Balland states (*Comptes rendus*, l. c.) that when crushed the seeds of *Voandzeia* yield a white flour with a characteristic pulse

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odour, but that, when boiled, they have exactly the flavour of chestnuts. He calls attention further to the fact that if we admit the contention of physiologists that the human frame, in order to repair natural loss of tissue, requires daily 120 to 130 grammes of nitrogenous matter, 56 grammes of fatty matter and 500 grammes of carbohydrates, we have, even if the co-efficients of digestibility are taken into account, these elements almost exactly present in a kilogramme of *Voandzeia* seeds. He further remarks that these seeds afford the first instance known to him of a natural substance possessing to an equal degree the chemical features of a complete food.

There is nothing to record concerning the mode of culture save that Pailleux and Bois (*Potager d'un curieux*, ed. 2, p. 568), quoting from a correspondent in the Transvaal, recommend that the growing plants be earthed up.

As the name "ground-nut" implies, the seeds mature under ground. To facilitate the necessary burial of the pod—for none mature that cannot bury (Correa de Mello in *Journ. Linn. Soc.*, xi., 254)—the short, somewhat flattened, hairy branches lie prone on the surface of the earth, often penetrating it where soft and always dipping downwards at the tip. On the primary and a few of the secondary branches are a few leaves, large, erect and trifoliate. The inflorescences, either terminal or from the axils of the leaves, are two-flowered and invariably penetrate the earth unless prevented by some solid body. The flowers thus produced underground, one on each side of a wart-like termination to the axis—may remain subterranean or may reach the surface by the elongation of the pedicel and open as small pale yellow pea-like blossoms. In fruiting the ovary is drawn underground. The subterranean flowers, provided like the aerial with pedicels, lie folded on to these and do not develope any of the conspicuous parts; their petals are absent and so reduced are the stamens that observers have thought them female.

At times all the flowers are aerial, at times all are subterranean; and the earthing-up recommended in the Transvaal has for its object the burying of flowers and fruit.

The fruit is very like that of *Arachis hypogæa*, but is shorter and usually one-seeded at maturity. Though indehiscent, it is bordered by a prominent sutural ridge such as is not seen in *Arachis*. The sides are faintly reticulated, and the total length is about $\frac{3}{4}$ inch.

Although in many respects very like *Arachis hypogæa*, *Voandzeia* belongs to a different tribe of the Leguminosæ being much more closely allied to the Haricot beans.

The Bambarra earth-nut long ago found its way into Brazil where it has passed under the name of Angolan mandubi or earth-nut. India and Malaya have received it and it is cultivated in gardens to a small extent. It has been tried in North Australia and gave a large yield (Mueller, *Select Plants for Extra-trop. Culture*, p. 576), but nowhere has its cultivation assumed any large proportions.

I. H. BURKILL.

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XI.—DECADES KEWENSES.

PLANTARUM NOVARUM IN HERBARIO HORTI REGII CONSERVATARUM.

DECADES XL., XLI.

In a previous issue (*Kew Bulletin*, 1906, n. 1.) only six species of the fortieth decade were described. That decade is here completed and an additional decade of diagnoses provided.

397. **Strombosia latifolia**, *Stapf* [Icacinaceae]; species distinctissima ob folia magna obtusissima.

Rami ut tota planta glaberrimi, pallide virides vel fuscescentes, 3–4 mm. crassi. *Folia* late oblonga vel elliptica, obtusissima, rarius apice mucronulata, basi late rotundata, 12·5–18 cm. longa, 6–10 cm. lata, supra pallide viridia, subtus lurida, coriacea, costa subtus valida, nervis lateralibus 10–12, venis transversis distantibus. *Flores* pauci in axillis foliorum, arcte glomerulati glomerulis sessilibus. *Pedicelli* brevissimi, bracteis minutis rotundato-ovatis muniti. *Sepala* subrotunda, obtusa, vix 1 mm. longa. *Petala* late linearia, obtusa, apicibus reflexis, vix 4 mm. longa, intus villosa. *Filamenta* petalis arcte adhaerentia, subfiliformia, iis ½-breviora, glabra. *Ovarium* superum, obtuse 5-gonum, truncatum; stylus staminibus aequilongus; stigma subcapitatum, sublobatum.

BORNEO. Sarawak, Bau, *Haviland's* collector, 2,007.

398. **Stemonurus evenius**, *Stapf* [Icacinaceae]; affinis *S. umbellato*, Becc., sed foliis crassioribus eveniis, cymis brevibus valde contractis distincta.

Ramuli 5–6 mm. crassi, primo brevissime tomentelli, saepe resina exsudata illiti, demum glabrati, cinereo-ochracei. *Folia* elliptica vel oblonga, obtusissima, emarginata, basi rotundata vel brevissime acuta, 10·8–13 cm. longa, 5–6 cm. lata, valde coriacea, glaberrima, opaca, subtus pallide fuscescentia, glandulis medio depressis obsita, costa subtus valida, caeterum evenia; petiolus 2·5 cm. longus, crassus, supra tenuiter sulcatus. *Cymae* axillares, 10–12-florae, valde contractae, papilloso-tomentellae, pedunculo 1·2 cm. longo vel breviore suffultae; pedicelli subnulli. *Calyx* cupulatus, truncatus vel obscure 5-lobulatus, minute papilloso-tomentellus, 3 mm. longus. *Petala* lineari-oblonga, 6–6·5 mm. longa, apice inflexa, utrinque glabra. *Filamenta* spatulato-linearia, antice sub anthera dense barbata, dorso in apice longe penicillata. *Discus* cupularis, lobulatus. *Ovarium* breviter cylindrico-conicum, glabrum; stylus brevis.

BORNEO. Sarawak, mouth of Sarawak River, *Haviland's* Collector, 1909.

399. **Stemonurus labuanensis**, *Stapf* [Icacinaceae]; valde affinis *S. apicali*, Thw., sed foliorum nervis numerosioribus 3–5 mm. distantibus subtus haud glaucis, cymis minus contractis, bracteis parvis vel saepe minutis distincta.

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Arbor parva (teste *Motley*). *Ramuli* glabri, juveniles resina exsudata illiti, brunnei. *Folia* obovata vel obovato-oblonga, abrupte breviterque acuminata, basi acuta vel subacuta, 10–11 cm. longa, 5–6 cm. lata, coriacea, glabra, supra lucida, subtus opaca, pallidiora sed haud glauca, costa supra impressa subtus prominente, nervis lateralibus numerosis subaequalibus vel tenuioribus interjectis; petiolus 2·5 cm. longus, teres, supra tenuiter sulcatus. *Cymae* umbellatim congestae, valde contractae, pedunculo 6–8 mm. longo suffultae; ramuli 2 mm. longi vel breviores; pedicelli subnulli; bracteae ovatae, 1 mm. longae. *Alabastra* truncata, apice depressa. *Calyx* cupulatus, latissime brevissimeque 5-dentatus, puberulus. *Petala* lineari-oblonga, apice inflexa, utrinque glabra, vix 4 mm. longa. *Filamenta* spatulato-linearia, dorso in apice penicillata, antice sub ipsa anthera barbata. *Discus* cupularis, undulato-truncatus. *Ovarium* oblongum, sensim in stylum abiens. *Lasianthera apicalis*, Mast. in Hook. f., Fl. Brit. Ind. I., p. 584 (partim, quoad Borneo).

BORNEO. Labuan, *Motley*, 131. Sarawak, Baram, *Ch. Hose*, 107.

Motley's specimen from Labuan was referred by Masters to *Lasianthera apicalis* (= *Stemonurus apicalis*, Thw.) a Ceylon plant. In habit the two are very similar, and the shape and size of the leaves are quite the same in the Ceylon and the Borneo plant; but the leaves of the true *Stemonurus apicalis* are distinctly glaucous, like those of *S. lanceolatus*, Becc., and the nerves are wider (5–6 mm.) apart, the flower-buds are shorter and distinctly convex not truncate and depressed, and the whole inflorescence is contracted into a dense headlike cluster which is subtended by rather large bracts.

400. **Phytocrene porphyrea**, *Stapf* [Icacinaceae]; affinis *P. borneensi*, Becc., sed foliis subtrilobis, capitulis majoribus multo longius pedunculatis (pedunculis 4–6 mm. longis) cinereo-villosis, bracteis summis in caudas rufo-purpureo-barbatas 2·5–3 cm. longas productis distincta.

Rami sulcati, setulis rufis patulis obsiti, 6 mm. crassi. *Folia* (unum vidi) e basi cordata subtriloba, acuta, 18 cm. longa, 15 cm. lata, coriacea, utrinque in nervis rufo-setulosa, subtus praeterea ochraceo-tomentosa, 5-nervia, prominenter reticulata, nervis lateralibus supra basin e nervo intermedio ortis utrinque 3; petiolus 8 cm. longus, tomentellus, praeterea setis rufis patulis dense vestitus. *Inflorescentia* e ligno vetusto, pedunculo brevissimo basi bracteis caudato-subulatis crebris vestito suffulta, 12 cm. longa, 3 cm. lata, pendula; rhachis ut rami ramulique cinereo-villosula; rami 12–18 mm. longi, flexuosi; ramuli capituligeri 5–6 mm. longi. *Capitula* globosa, cinereo-villosa, 3–4 mm. diametro. *Calyx* in segmenta 4–5 fissus vel 4–5-lobus; tubus glaber; lobi obovati, obtusi, dorso longe albo-villosi. *Corolla* (juvenilis) campanulatus, ad medium 4–5-loba, lobis acutis, pilis paucis conspersa. *Antherarum* loculi omnino discreti. *Ovarium* rudimentarium subulatum, longe albo-hispidum.

BORNEO. Sarawak, Kuching, *Haviland*, 3140.

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401. **Sonerila laeta,** *Stapf* [Melastomaceae]; affinis *S. maculatae,* Roxb., sed indumento tenuissimo brevissimo denso, caule plane terete, foliis margine eciliatis distincta.

Herba erecta, 15 cm. alta. *Caulis* teres, glanduloso-puberulus. *Folia* cuiusque paris subaequalia, petiolata, ovata vel elliptico-ovata, symmetrica vel paulo asymmetrica, plus minusve acuminata, basi rotundata interdum uno latere breviore, majora ad 10 cm. longa, ad 5 cm. lata, membranacea, supra saturate viridia et albo-guttata, infra purpurea et viridi-maculata maculis suborbicularibus utrinque correspondentibus, supra minutissime sparseque puberula et interdum e maculorum centro breviter setulosa, infra brevissime sparseque glandulosa-pilosula, margine denticulato-serrata dentibus purpureis haud in setas abeuntibus, pinnatinervia, nervis lateralibus 6–9 (in foliis asymmetricis 4–5 in latere majore); petioli 1·5–3 cm. longi, eodem indumento ac caulis. *Cyma* terminalis, contracta, 7-flora, pedunculo ultra 2·5 cm. longo suffulta, undique dense brevissime puberula praetereaque glandulis stipitatis patulis obtecta, ebracteata; pedicelli ad 4 mm. longi. *Calyx* oblongo-cylindricus, 6 mm. longus, purpureus, dentibus latis obtusis brevissimis. *Petala* oblonga, subacuminata, 6 mm. longa. *Antherae* sulphureae, rostrato-acuminatae, 6–8 mm. longae. *Stylus* 14 mm. longus, stigmate subcapitato.

CHINA. Cultivated by Messrs. J. Veitch & Sons (in 1900) from seeds collected by Mr. *E. H. Wilson.*

402. **Medinilla chionantha,** *Stapf* [Melastomaceae]; affinis *M. longipedunculatae,* Cogn. et *M. succulentae,* Bl.; ab illo foliis angustioribus basi longe attenuatis triplinerviis, pedunculis brevibus, floribus majoribus, ab hac imprimis inflorescentiis floribusque multo majoribus differt.

Frutex glaberrimus; rami teretes, griseo-brunnei, ob lenticellos majusculos verrucosi, florigeri ad 6 mm. crassi. *Folia* opposita, subsessilia, lanceolato-oblonga, acuminata, basi longe angustata, in petiolum brevissimum decurrentia, ad 15 cm. longa, 4·5–6 cm. lata, triplinervia, nervis lateralibus circiter 2·5 cm. supra basin ortis. *Cymae* axillares, pseudo-umbellatae, pedunculo communi 10–14 mm. longo, specialibus 1–2 floribus 8–12 mm. longis; bracteae acutae, minutissimae; pedicelli graciles, albi, 4–6 mm. longi. *Flores* plerumque 5-meri. *Calyx* niveus, 9 mm. longus, 7 mm. diametro, truncatus, denticulis obscuris viridibus. *Petala* late elliptica, obtusa, 16 mm. longa, 12 mm. lata, carnosa, nivea. *Antherae* aequales, ad 8 mm. longae, connectivo flavescente basi utrinque bilobo lobis aureis, caeterum albae.

PERAK. Raised (in 1897) by Messrs. J. Veitch & Sons from seeds collected by Mr. *C. Curtis.*

403. **Achillea sieheana,** *Stapf* [Compositae]; affinis *A. fragrantissimae,* Sch. Bip., sed caulibus gracilioribus flexuosis, foliis majoribus tenuiusque serrulatis, capitulis radiifloris, corollae basi tandem dilatata spongiosa differt.

Suffrutex ramosus 6–7·5 dm. altus, fragrantissimus, ramis tenuibus flexuosis teretibus tenuiter araneoso-villosulis, ramulis numerosissimis brevibus praeditis. *Folia* sessilia, lineari-oblonga, obtusiuscula, minute serrulata, axis primariae 1·2–2·5 cm. longa,

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3–5 mm. lata (ramulorum duplo vel ultra minora), dense glanduloso-punctata, adpresse araneoso-canescentia. *Capitula* 3–4 in ramorum apicibus, in corymbum disposita, semiglobosa, 5 mm. longa, pedunculis inaequalibus, infimo ad 18 mm. longa; involucri phylla late oblonga, obtusa, araneoso-villosa; paleae oblongae, obtusae, araneosae. *Flores* ligulati, circiter 7–8; ligulae 2–3 mm. longae, 2 mm. latae, 3-dentatae, aureae; corollae tubus basi paululo ultra ovarii apicem deorsum productus, infra medium tandem dilatatus, spongiosus, anguste bialatus.

ASIA MINOR. Raised at Kew from seeds collected by Herr *W. Siehe* in Cilicia.

404. **Ardisia gigantifolia**, *Stapf* [Myrsinaceae]; affinis *A. odontophyllae*, Wall., sed foliis multo majoribus in petiolum late decurrentibus, inflorescentia ampliore ex umbellis longiuscule pedunculatis composita, alabastris globosis 4 mm. diametro, antheris obtusis distincta.

Caulis crassitie digiti, vix ultra 15 cm. altus, minutissime puberulus, vel glabratus. *Folia* inferiora circa 2–3 cm. distantia, superiora conferta, alterna, elliptica vel longo-elliptica, obtusa, basi in petiolum decurrentia, 30–35 cm. longa, 17–20 cm. lata, in margine revoluto breviter pectinato-fimbriata, bullata, supra saturate viridia, lucida, tenuissime griseo-pubescentia, infra glabra, nervis lateralibus utrinque circiter 12 uti venis infra prominentibus validis; petiolus robustus semiteres, ad 6·5 cm. longus, ob lamina decurrente quasi alatus. *Panicula* longe-pedunculata, 15 cm. longa, laxe ramosa, ex axilla folii admodum reducti e basi lata cordato-ovata lanceolati acuti undulati orta, tenuissime pubescens, cymis umbelliformibus, bracteis subulatis minutis, pedicellis cernuis ad 18 mm. longis roseis. Flores pentameri rosei. *Calyx* tenuissime papilloso-puberulus, segmentis rotundata-ovatis dextrorsum convolutis 2 m. longis. *Corolla* in alabastro globosa, dextrorsum convoluta, aperta semigloboso-cupuliformis, glabra, vix 8 mm. diametro, basi breviter gamopetala, segmentis concavis late-ovatis obtusis. *Stamina* libera; filamenta crassa, perbrevia, imae corollae basi affixa; antherae late oblongae, obtusae, 2 mm. longae, longitudinaliter dehiscentes. *Ovarium* globosum, rufo-papillosum; stylus filiformis, 3 mm. longus; stigma punctatum. *Ovula* circiter 5, placentae hemisphaericae immersa. *Fructus* ignotus.

SOUTH CHINA. Cultivated by Messrs. J. Veitch & Sons (in 1901) from seeds collected by Mr. *E. H. Wilson.*

405. **Trachelospermum crocostomum**, *Stapf* [Apocynaceae]; a *T. jasminoidi*, Lem., calyce minore rubente segmentis erectis corollæ tubo basi sanguineo angusto appressis et corollae limbo pallide flavescente ore croceo diversum.

Frutex more *Hederae* scandens, ramis gracilibus flexuosis patule pilosis teretibus. *Folia* ovata, elliptico-oblonga vel subobovata, obtusiuscula, interdum obscure acuminata, basi breviter acuta, 1·8–3·8 cm. longa, 1·3–1·8 cm. lata, tenuiter coriacea, glaberrima, supra lucida et saturate viridia, infra pallidiora, nervis secundariis utrinque circiter 8, uti venis laxe anastomosantibus utrinque leviter prominulis; petioli juniores

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quidem pilosi, demum ad 4 mm. longi ; stipulae nullae ; glandulae interpetiolares et intrapetiolares in annulum dispositae, purpureae. *Flores* in cymas paucifloras terminales vel pseudo-axillares pedunculatas dispositi, suaveolentes ; pedunculus gracilis, fusco-rubescens, 2·5–6·3 cm. longus ; bracteae minutae, rubescentes, ovato-oblongae vel lanceolatae, acutae ; pedicelli minute bracteolati, glabri, 12 mm. longi. *Calyx* rubescens, 2 mm. longus (rarius paululo longior), glaber, intus basi annulo glandulorum cinctus ; sepala triangulari-ovata vel interiora oblonga, acuta, corollae tubo appressa. *Corolla* hypocrateriformis ; tubus vix 7 mm. longus, a basi ultra medium anguste cylindricus et sanguineus, superne ampliatus, flavescens, ore intus jugis staminibus suprapositis et ad ea decurrentibus papilloso-pilosis instructus ; limbus pallide alutaceo-flavescens, 16 mm. diametro, ore croceo piloso, lobis oblique obovatis obtusis. *Antherae* os attingentes, haud exsertae, 6 mm. longae. *Discus* e segmentis 5 ellipticis obtusis integris formata. *Fructus* ignotus.

CHINA ? A plant of this species has been in cultivation at Kew for many years. It is perfectly hardy. Nothing is known as to its origin, but there is little doubt that it came from China.

406. **Linaria (§Chaenorrhinum) gerensis**, *Stapf* [Scrophulariaceae]; affinis *L. origanifoliae*, DC., sed floribus duplo minoribus et calycis segmentis sursum latioribus corollae tubum subaequantibus differt.

Herba perennis. *Caules* graciles, e rhizomate tenui ascendentes, inferne glabri, superne sparse minuteque glanduloso-pubescentes. *Folia* inferiora opposita, superiora sparsa, late elliptica, obtusa, majora 8–10 mm. longa, 8–6 mm. lata, abrupte vel sensim in petiolum 2–4 mm. longum attenuata, glaberrima vel summa (floralia) glanduloso-pubescentia, crassiuscula, siccata plane opaca. *Pedicelli* tenuiter filiformes, flexuosi, ad 8 mm. longi, minute glanduloso-pubescentes. *Calycis* laciniae spathulato-lineares, inaequilongae, postica 4–5 mm. longa, parce glanduloso-ciliatae. *Corollae* tubus subcylindricus, 8 mm. longus, parce pubescens, calcare brevi saccato vix 2 mm. longo ; labium superum lobis subquadratis emarginatis, inferum basi in palatum leviter protrudens inflatum, 3 mm. longum, lobis emarginatis deflexis intermedio paulo longiore. *Ovarium* minute glanduloso-pubescens ; loculi inaequales, uterque ovuliger. *L. rubrifolia*, Boiss., Fl. Or. IV. 383 (partim), non Rob. et Cast. in DC.

PERSIA. On rocks near Gere, between Bushir and Shiras, *Kotschy*, Pl. Pers-Austr. 92.

407. **Linaria (§ Chaenorrhinum) Johnstonii**, *Stapf* [Scrophulariaceae] ; affinis *L. rubrifoliae*, Rob. et Cast., foliis omnibus glanduloso-pubescentibus, corollae tubo subobconico, limbo majore, capsulae loculo altero multo minore interdum vacuo diversa.

Herba annua, 5–15 cm. alta, tota patule glanduloso-pubescens. *Folia* inferiora opposita, superiora sparsa, elliptica vel oblonga, obtusa, ad 16 (raro ad 20) mm. longa, 4–8 mm. lata, exsiccata subpellucida, concoloria, in petiolum brevissimum vel ad 2 mm. longum attenuata. *Pedicelli* graciles, tandem ad 12 mm. longi. *Calycis* segmenta lineari-spatulata, 5 mm. longa, sub maturitate

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paulo accrescentia. *Corolla* purpureo-coerulea; tubus 4 mm. longus, subobconicus, intus sub palato lineis 2 flavo-papillosis et sub labio supero maculo atro-violaceo notatus, calcare tenui acuto 2 mm. paulo longiore; labium superum erectum lobis truncatis, inferum 2 mm. longum, basi in palatum pallidum purpureo-maculatum longiuscule protrudens inflatum, lobis subaequalibus obtusissimis vel emarginatis. *Capsula* minute glanduloso-pubescens, diametro 5 mm., loculis admodum inaequalibus, altero majore plerumque irregulariter rumpente vel valvulis 3 brevibus dehiscente, altero saepe minuto indehiscente vel rumpente vacuo vel seminibus perfectis paucis. *Semina* cuneato-oblonga, truncata, costis crebre undulato-denticulatis. *L. minor*, Aitch., Cat. Punjab Pl. 105; Hook. f., Fl. Brit. Ind. IV. 252, non Desf. *L. rubrifolia*, Boiss, Fl. Or. IV. 365 (partim).

BALUCHISTAN. Gundava Hill, *Stocks*, 597. AFGHANISTAN. Hindu-Kush, "Kulloo," *Griffith*, 1116; Kyber Pass, *H. H. Johnston*, 157; INDIA. Punjab, Rawal Pindi, "Hussara," *Aitchison*.

Quite distinct from *L. minor*, Desf., by the broad leaves and the structure of the capsule. Aitchison quotes l. c. "*Fleming*, Salt Range, Vicary, Upper Punjab. *Stewart*, Hazara." I have seen only one specimen from India, collected by Aitchison after the publication of his Catalogue of Punjab Plants, but there is little doubt that Fleming's, Vicary's, and Stewart's plant belong also to *L. Johnstonii*. The capsule-walls are very fragile and break up irregularly, but the larger ovary-cell also dehisces sometimes by 3 small valves at the apex.

408. **Cervantesia glabrata**, *Stapf* [Santalaceæ]; a speciebus caeteris foliis adultis glabris et inflorescentiarum axibus subglabris diversa.

Arbor parva, ramis vetustis teretibus cortice griseo obtectis, junioribus angulatis, novellis cum gemmis griseo-pubescentibus mox glabratis. *Folia* elliptica, apice rotundata, basi breviter acutata, 5–8 cm. longa, 3·5–4 cm. lata, herbacea, integra, adulta glaberrima, nervis secundariis utrinque circiter 5 ut venis laxe anastomosantibus tenuibus; petiolus 3–5 mm. longus. *Flores* subsessiles, in glomerulos parves secus rhachin spicae spuriae dispositi; spicae 1–2, e basi ramulorum saepe admodum abbreviatorum ortae, graciles, 3–4 cm. longae (cum pedunculo circiter 1·8 cm. longo); rhachis superne pubescens; bracteae minutae, oblongae, pubescentes. *Perianthium* in alabastro globosum, apertum, ad 3 mm. longum, extus pubescens, ad medium 5-lobum lobis triangularibus subacutis intus medio barbatis. *Antherae* 1 mm. longae, thecis distinctis rimis singulis dehiscentibus. *Disci* lobi crassi truncati vel subretusi, perianthii segmentis dimidio minores. *Ovarium* in receptaculo ultra medium immersum; stylus columnaris; stigma 2–3-lobum; ovula 2, pendula, ex apice placentae erectae brevis columnaris.

SOUTH AMERICA. Ecuador, *Eggers*, 15,649.

409. **Calathea Gouletii**, *Stapf* [Marantaceae]; affinis *C. Legrelleana*, Reg., differt statura majore, imprimis petiolis scapisque longioribus, spicae bracteolis (prophyllis specialibus) brevioribus apice vix induratis, floribus albis.

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Folia scapique basalia. *Foliorum* vaginae ad 10 cm. longae, purpurascentes, glabrae; petioli purpurascentes, superne imprimis in articulo calloso minute puberuli, ad 30 cm. longi; laminae oblique ellipticae, acutae, basi rotundatae, 17–23 cm. longae, 8–10 cm. latae, supra basi parce pubescenti excepta glabrae, inter costam pallide viridem et margines saturate virides albo-virides, subtus purpureae, molliter breviterque pubescentes. *Scapi* basi vaginati, 22–45 cm. alti, glabri. *Spicae* subcylindricae, ad 12 cm. longae. *Bracteae* subdistichae, densae, amplectentes, inferiores 8–9 fertiles, circiter 2·5 cm. longae, latae, ad medium bilobae lobis obtusissimis, superiores 4 steriles, summae lanceolatae, ultra 2·5 cm. longae, omnes glabrae. *Florum paria* alborum plerumque 3 cum unaquaque bractea; bracteolae (prophylla specialia) singulae, lineares, apice vix induratae. *Sepala* lineari-lanceolata, subacuta, 8 mm. longa. *Corallae* tubus circiter 16 mm. longus; segmenta subaequalia, oblongo-lanceolata, subacuta. *Staminodium* externum petaloideum, obovato-spathulatum, 9 mm. longum; staminodium callosum cucullatum, stamen aequans, appendiculis 2 (interno anguste lineari externo ovato calloso), late obovatum, subbilobum, 10–11 mm. longum, basi prope stamen callo brevi cristiformi instructum. *Anthera* 2 mm. longa. *Capsula* 9–10 mm. longa, roseo-suffusa. *Semina* grisea 7 mm. longa, areolato-impressa; arillus 2-lobus lobis imbricatis lateraliter appendiculatis; ductus perispermaticus indivisus.

Cultivated at Kew under the name *Maranta Gouletii*, Hort. The origin of the plant is unknown.

410. **Digitaria pacifica**, *Stapf* [Gramineae]; affinis *D. stenotaphrodi*, Stapf (*Panicum stenotaphrodes*, Nees ex Steud.), sed spiculis minoribus collate latioribus, gluma superiore (postica) breviore latioreque et palea valvae inferiori addita distincta (quoniam parva) recedit.

Gramen annuum (?), ad 6 dm. altum. *Culmi* fasciculati, erecti, 8–12 nodi, glabri, laeves; internodia a basi versus medium increscentia (ad 4–10 cm. longa), deinde breviora, summum (pedunculus) elongatum, ad 10 cm. longum. *Foliorum* vaginae laxiusculae, glabrae, laeves, dorso superne carinatae, intermediae et summa saepe internodiis breviores; ligulae scariosae, truncatae, 2–2·5 mm. longae; laminae lineares, longe et tenuiter acutatae, 5–15 cm. longae, 5–6 mm. latae, firmae, juniores rigidae, glaberrimae, laeves (etiam in marginibus), nervo intermedio subtus prominulo. *Racemi* (spicae spuriae) 3–5 in culmorum apices digitati, erecti, contigui, 4–4·5 cm. longi; rhachis applanata, 2–3 mm. lata, glaberrima, laevissima, ob costam tenuem admodum prominentem quasi tri-alata; pedicelli brevissimi, crassi, secundum costam alternantes. *Spiculae* 2-seriatae, imbricatae, ambitu ovatae vel ellipticae, 2–2·25 mm. longae, 1·8–1·9 mm. latae, pallidae. *Gluma inferior* plane suppressa, raro rudimentaria ope lentis validae visa, *superior* latissime ovata, obtusiuscula, spiculam basi amplectens, 0·3 mm. longa, hyalina, glabra vel minutissime pubescens. *Valva inferior* spicula paulo brevior, obtusa, 5-costata, ad costas et inferne et apicem versus inter eas minute puberula, paleam obovato-rotundatam squamiformem fere 0·5 mm. longam et lodiculas 2 obovatas 0·3–0·4 mm. longas fovens, *superior* ovata,

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subacuta, quam inferior angustior, glaberrima, laevis, 3-nervis, subchartacea, margine hyalino latiusculo, cum palea fere aequilonga structura simili et flore hermaphrodito. *Filamenta* ex apice anthoecii exserta; antherae ignotae. *Ovarium* elongato-oblongum; stigmata plumosa, 1 mm. longa, ex apice anthoecii exserta. *Caryopsis* ignota.

POLYNESIA. Christmas Island, communicated by Mr. *J. H. Maiden.*

Digitaria stenatophrodes ranges from the Carolines to the Paumotu Archipelago. I have seen specimens from the following localities: Carolines, Ifaluk (Wilson) Island, *Wilkes's Exped.*; Gilbert Group, Uteite, *Powell*, 51; Phœnix Group, Canton Island, *J. J. Lister*; Paumotu Archipelago, Hao (Bow Island), *Hincks*, *Barclay*; Anaa (Chain Island), *Cuming*, 1395; Tataro (King's Island), *Wilkes's Exped.* Another nearly allied species is *Digitaria platycarpha*, Stapf (*Panicum platycarphum*, Trin.), collected by C. Wright (of Ringgold and Rodgers's expedition) on the summits of mountains in the Bonin Islands where it grows in dense patches. These two species and *D. pacifica* form a marked natural group which seems to be quite peculiar to the Pacific Islands. This is the more interesting as all the localities mentioned above, with the exception of Bonin, are low coral islands.

XII.—DIAGNOSES AFRICANÆ, XV.

801. **Ochna tenuissima**, *Stapf* [Ochnaceae]; *O. padiflorae* Gilg, proxima, foliis tenuioribus basi magis cuneatis, paniculis longioribus magis ramosis, pedicellis longioribus, floribus paulo minoribus distincta.

Frutex humilis, glaberrimus, ramis fuscescentibus gracilibus. *Folia* oblanceolata, breviter acuminata, basin versus longe cuneatim attenuata, toto margine spinuloso-serrata spinulis valde prorsus curvatis, 9–14 cm. longa, 2–4 cm. lata, tenuiter membranacea, laete viridia, nervis lateralibus utrinque 12–15 patulis, venarum reticulatione tenuissima; petioli 2–3 mm. longi; stipulae subulato-filiformes, caducae, petiolis aequilongae. *Paniculae* oblongae, laxae, 5–15 cm. longae, 4–9 cm. latae, ramis racemos elongatos ad 5 cm. longos vel valde abbreviatos referentibus patulis; bracteae caducae, filiformes; pedicelli divaricati, graciles, ad 2 cm. longi. *Sepala* ovata, obtusa vel subobtusa, sub anthesi 3–4 mm. longa, demum paulo longiora. *Petala* spatulata, sepalis aequilonga, flava. *Antherae* sub apice dehiscentes, 1·7 mm. longae. *Stylus* 4–4·5 mm. longus; stigmatis lobi minuti.

UGANDA. Entebbe, 1170 m., *E. Brown*, 345.

802. **Dissotis modesta**, *Stapf* [Melastomaceae]; affinis *D. rotundifoliae*, Triana, differt receptaculo ob glandulas parvas et pilos (paucis majoribus exceptis) minutas sparsas oculo nudo subglabro, appendicibus cum sepalis alternantibus parvis apice stellato-hispidulis, ramis adpresse parceque setosis.

Caulis gracilis, acute quadrangularis, parce adpresse setosus setis asperulis parvis basi incrassatis. *Folia* oblonga, acuta, basi

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obtusa, margine ciliato minute serrulata, ad 4 cm. longa, 1·8 cm. lata, utrinque hirsuta, 5-nervia nervis extimis supra medium evanescentibus; petiolus 6 mm. longus. *Flores* 5-meri, pauci, ad ramorum apices congesti; bracteae ovatae vel ovato-oblongae, acutae, ciliolatae, ad 4 mm. longae, herbaceae. *Receptaculum* oblongum, 6 mm. longum, glandulis parvis et pilis minutis (nonnullis majoribus) asperulis conspersum, oculo nudo fere glabrum. *Sepala* basi latissima, subito lanceolata vel linearilanceolata, 3 mm. longa, ciliolata, cum appendicibus brevibus apice minute stellato-hispidulis alternantia. *Petala* obovatoelliptica, ad 12 mm. longa, 6 mm. lata. *Stamina* episepala antheris coeruleo-purpureis undulato-bullatis 8 mm. longis, connectivo rubescente basi 2 mm. producto antice appendice luteo bilobo subaequilongo instructo; stamina epipetala antheris episepalis fere aequilongis praeter porum caerulescentem ex toto flavis, connectivo basi breviter producto appendice antico ei aequilongo. *Stylus* purpurascens.

UGANDA. Raised at Kew from seeds communicated by Mr. *M. T. Dawe.*

803. **Empogona Allenii,** *Stapf* [Rubiaceae]; affinis *E. Kirkii*, *Hook.* f., differt floribus pendulis, multo longius pedicellatis, duplo majoribus.

Frutex humilis, divaricatus; ramuli tenuiter tomentello-pubescentes, cortice griseo-brunneo. *Folia* decidua, ovata vel oblongo-ovata, acuta, basi breviter attenuata (immatura), ad 2 cm. longa, ad 1 cm. lata, supra minute pubescentia, subtus primo fere albo-tomentosa, nervis lateralibus utrinque circiter 6; petioli 1–1·5 mm. longi, albo-tomentelli; stipulae e basi lata triangulari-subulatae, 3 mm. longae, subpersistentes. *Cymae* sessiles, e ramis annotinis ortae, 6–10-florae, basi perulis rotundato-ovatis latis pubescentibus cinctae; pedicelli graciles, 3–4 lin. longi, griseo-puberuli; bracteolae lineari-lanceolatae, ad 1·5 mm. longae. *Receptaculum* obovoideo-turbinatum, griseo-puberulum, 1 mm. longum. *Calyx* 5-partitum, 1 mm. longum, segmentis ovatis obtusis tenuiter membranaceis. *Corolla* alba, suaveolens, in alabastro maturo 12 mm. longa; tubus subcylindricus, superne paulo dilatatus, 6 mm. longus, extus glaber, ore longe dense villosus villo 3 mm. longo; lobi oblongi, obtusi, tubo paulo breviores, reflexo-patuli. *Antherae* 5 mm. longae. *Discus* glaber. *Stylus* apice bifidus, 3 mm. e corollae ore exsertus.

RHODESIA. Near the Victoria Falls, in flower in October and November, *C. E. F. Allen*, 55.

804. **Ferretia aeruginescens,** *Stapf* [Rubiaceae]; affinis *F. apodantherae*, Del., differt foliis junioribus subtus albo-subtomentosis, floribus fructibusque duplo majoribus.

Frutex ramis divaricatis, junioribus griseo-tomentellis, vetustioribus cortice pallide brunneo lamellis tenuibus angustis longitudinaliter dissoluto obtectis. *Folia* decidua (juniora ad ramorum apices congesta tantum nota), elliptica, acuta, basi rotundata vel breviter acuta, ultra 2·5 cm. longa, ad 1·8 cm. lata, supra minute pubescentia, subtus albo-subtomentosa (imprimis prope nervos), nervis lateralibus utrinque circiter 6; petioli tomentelli, ad

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2 mm. longi; stipulae oblongae, membranaceae, obtusae, cuspidatae, 6 mm. longae. *Flores* 1–2 intra perulas gemmarum scarioso-membranaceas rotundatas orti, cum foliis primis aperti; pedicelli brevissimi, albo-villosuli, bracteolae lanceolatae vel lineares, 2 mm. longae, scarioso-membranaceae. *Receptaculum* hemisphæricum, albo-tomentellum. *Calyx* 5-partitum; segmenta linearioblonga e basi plerumque dilatata, apice obtusa, interdum subcuspidata, ad 4 mm. longa, basi tomentella, superne scarioso-membranacea, rubescentia, glabra. *Corolla* in alabastro maturo 25 mm. paulo excedens, primo lutea, deinde albescens, exsiccando aeruginoso-virescens (imprimis ad os et secundum nervos); tubus infundibularis, ad 16 mm. longus, extus glaber, intus ab ore ultra medium pilosus; lobi oblongi, obtusi, ad 20 mm. longi, ad 8 mm. lati. *Antherae* 6 mm. longae. *Discus* carnosus, parce minutissime pilosus. *Stylus* 15 mm. longus, medio parce pilosus, superne leviter incrassatus, sulcatus, 2-dentatus. *Ovarii* loculi 2, ovula in utroque loculo 4–5, placentae disciformi insidentia. *Bacca* globosa, 12 mm. diametro. *Semina* compressa, ambitu late oblique elliptica; testa brunnea, foveolata; endosperma corneum. *Embryo* 3 mm. longus, horizontalis, radicula cotyledonibus suborbicularibus aequilonga.

RHODESIA. Near the Victoria Falls, *C. E. F. Allen*, 57.

Ferretia seems to differ very slightly from *Randia*, the distinguishing characters which are generally adduced—*i.e.*, the slender style, the small number of ovules and the non-immersion of the ovules in the placenta—being not without parallels in *Randia*.

805. **Pavetta luteola**, *Stapf* [Rubiaceae]; affinis *P. Baconiæ*, Hiern, differt floribus praecocibus pentameris minoribus.

Frutex divaricatus; rami tenuissime villosuli villo longe persistente, cortice pallide brunneus. *Folia* (juniora ad ramorum apices congesta tantum nota) obovato-elliptica vel elliptica, obtusa vel subacuta, ad 18 mm. longa, ad 8 mm. lata, supra minute pubescentia, subtus fere tomentosa imprimis secundum nervos, nervis lateralibus utrinque 5–6; petiolus brevissimus; stipulae e basi lata triangulari subulatae. *Corymbi* semiglobosi ad ramulorum apices, densiflori, 2·5 cm. diametro, griseo-tomentelli; rami et pedicelli perbreves; bracteae oblongo-lanceolatae, 2 mm. longae, subscariosae, rubescentes, albo-villosae. *Receptaculum* hemisphaerico-turbinatum, 1 mm. longum, tomentellum. *Calyx* 1·5 mm. longum, 5-partitum; segmenta elliptica, obtusa, imbricata, subscariosa, rubescentia, *Corolla* lutea, glabra, in alabasro maturo 4-lin. longa, clavata; tubus subcylindricus, tenuis, ad 4 mm. longus; lobi 5 lineari-oblongi, obtusi, tubum aequantes. *Stamina* 5; antherae exsertae, 3–3·5 mm. longae. *Ovarium* 2-loculare; ovulum placentae supra medium loculum ortae patelliformi carnosae insidens; stylus 6–8 mm. corollae os excedens; stigma integrum.

RHODESIA. Near the Victoria Falls, flowering in October, *C. E. F. Allen*, 54.

806. **Aristolochia** (Sect. **Polyanthera**) **flagellata**, *Stapf* [Aristolochiaceae]; affinis *A. promissae*, Mast., differt floribus cum foliis

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costaneis, foliis coriaceis breviter acuminatis conspicue nervosis, perianthii limbo cordato-ovato dentium caudis apice spatulato-dilatatis.

Frutex scandens, sempervirens, glaberrimus. *Rami* subcompressi, hinc inde contorti, grosse verrucoso-lenticellati, fusci, nitiduli, internodiis 5–8 cm. longis. *Folia* oblonga vel elliptica, breviter obtusiuscule acuminata, basi breviter acutata, 7–9·5 cm. poll. longa, 3–5 cm. lata, coriacea, nervis secundariis utrinque 4, infimis e basi ortis, intra marginem arcuatim connectis uti venarum reticulatione subtus conspicue prominulis; petiolus circiter 2·5 cm. longus. *Inflorescentiae* cicinnatae, brevissimae, subsessiles, e ramis foliiferis vel vetustioribus ortae; bracteae subulatae, 6-8 mm. longae. *Perianthium* basi inflatum, parte inflata globoso-obovoidea 3-3·5 cm. longa, 2·5 cm. lata, superne annulo intus prosilienti a tubo subcylindrico magis minusue incurvo 5–6 cm. longo ad medium 1·6–1·8 cm. lato intus pilis longis retrosis consperso separata; limbus late cordato-ovatus vel cordato-suborbicularis, circiter 4 cm. latus, 3-dentatus dentibus primo cohaerentibus demum liberis conniventibus sinubus angustis separatis e basi anguste triangulari longe caudatis, caudis filiformibus apicem versus dilatatis acutis 15-18 cm. longis in parte superiore ad 6 mm. latis spiraliter contortis. *Gynostemium* breviter stipitatum. *Antherae* 3 mm. longae. *Stigmatis* lobi 9, antheris subaequilongi, triangulari-lanceolati, undulati, apice cuspidati.

GOLD COAST COLONY. Aburi Gardens, *Johnson*, 487, 1060.

Mr. W. H Johnson describes the flowers thus: "outside whitish with purplish blotches, inside yellow with purple markings."

807. **Excoecaria Grahami**, *Stapf* [Euphorbiaceae]; affinis *E. guineensi*, Mull. Arg., habitu, foliis minoribus angustioribus haud acuminatis, eorum nervatione, bracteis obtusissimis distincta.

Suffrutex 15–30 cm. altus. *Rhizoma* 30–45 cm. sub soli superficie repens, ad intervalla 30–45 cm. ramos ascendentes superne caules 2–3 gerentes emittens, 6–10 mm. diametro, cortice brunneo. *Caules* graciles, juniores virides, demum pallide fuscescentes, glabri, internodiis brevibus vel 2·5–5 cm. longis. *Folia* oblonga vel lanceolato-oblonga, basi obtusa, apice subobtusa, in margine minute glanduloso-denticulata, ima basi utrinque glandula notata 3·5–13 cm. longa, 2·5–4 cm. lata, coriacea, glaberrima, viridia vel juvenilia purpurascentia, nervis utrinque circiter 11–16 patulis marginem versus longe prorsus curvatis plerumque indistincte arcuato-connexis uti venis transversis utrinque prominulis; petiolus 2 mm. longus; stipulae late triangulares, fimbriatae vel in fimbrias solutae, caducae. *Spicae* terminales, ima basi femineae, 1–2 cm. longae, rarius longiores, brevissime pedunculatae, glaberrimae; flores approximati; bracteae roseae, late obovatae vel rotundatae, truncatae, saepe minute apiculatae, 1 mm. longae, basi utrinque glandula viridi vel rosea disciformi addita. *Flos* ♂ pedicello quam bractea paula breviore basi interdum (flores ♂ inferiores) bracteola minute fimbriata minuta suffultus. *Peranthium* roseum, 3-partitum, segmentis ellipticis apice subacuto inflexo, vix 1 mm. longis. *Stamina* 3 antheris subdidymis, filamentis 1 mm. longis inter perianthii segmenta

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exsertis. *Flos* ♀ subsessilis, basi bracteolis 2 ovato-rotundatis fimbriatis suffultus: *Peranthium* roseum, 3-partitum, segmentis ovato-orbicularibus obtusis integris vel obscure denticulatis 1·5 mm. longis. *Ovarium* stylo brevi distincto, stigmatibus 3 recurvis. *Capsula* elastice dehiscens, 3-cocca, 12 mm. alta, 18 mm. diametro; cocci acuti, tenuiter carinati. *Semina* globosa, 5 mm. diametro, estrophiolata, flavida, fusco-maculata.

GOLD COAST COLONY. Northern Territory, Gambaga, in twos or threes along the roads, or in large patches, *W. M. Graham.*

The rhizomes, according to Mr. Graham, are "very rich in latex, which exudes rapidly from any wound." The plant is well known to the natives, who make use of the latex in the process of tatooing. The vernaculars in the local dialects are, to quote from Mr. Graham's report: 1, Dagonna dial.; Pampiga: Moshi dial.; Pulle: Grunshi dial.; Tullu: Hausa dial.; Zága Ráfi. (The letters are to be given German values in pronunciation.)

808. **Pennisetum (§ Gymnothrix) massaicum**, *Stapf* [Gramineae]; affinis *P. Thunbergii*, Kunth; differt culmis pluri-(ad 8-)nodis, glumis spiculae dimidio aequilongis vel superiore longiore, anthoecio inferiore plerumque ♂, valvis sensim in mucronem attenuatis, antheris apice obscure apiculatis.

Gramen perenne. *Culmi* e rhizomate cataphyllis coriaceis ovatis acutis prominenter nervosis obtecto erecti vel plerumque ascendentes vel basi prostrati, 15–45 cm. longi, pluri-(ad 8-)nodi, glabri, laeves nisi apice interdum asperuli, nodis exsertis, basi innovationes breves intravaginales emittentes, superne simplices vel parce ramosi. *Foliorum vaginae* nervosae, glabrae vel rarius pilis longiusculis tenuissimis conspersae, superiores arctae, ad 10 cm. longae, infimae multo breviores; *ligulae* ad marginem dense ciliatum reductae, laminae planae, saepe flaccidae, lineares, longe tenuiterque acutatae, 2·5–20 c.m. longae, 2–4 mm. latae, virides, glabrae vel rarius supra pilis tenuibus longiusculis parce conspersae, supra et in marginibus magis minusve asperulae. *Panicula* spiciformis, cylindrica, densa, 1·2–6 c.m. longa, 5–8 mm. diametro, pallida; rhachis minutissime puberula vel aspera, subsulcata, cicatricibus parvis spicularum delapsarum oblique verticillatis notata. *Spiculae* subsessiles, pallidae, 4–5·5 mm. longae, solitariae; involucri setae scaberulae, numerosae, longiores spiculas duplo excedentes. *Glumae* tenuiter membranaceae, albidae, ovato-lanceolatae, acute acuminatae, inferior 1-nervis, 2·5–3 mm. lin. longa, superior 5-nervis, 3–3·5 mm. lin. longa. *Valvae* membranaceae, albidae, lanceolatae, sensim in mucronulum attenuatae, 5–5·5 mm. longae, 5-nerves nervis superne prominulis, inferior cum palea et flore ♂ plerumque perfecto. *Lodiculae* nullae. *Antherae* apice minutissime apiculatae, 2 min. longae. *Styli* ima basi connati, tenuissimi, 2·5 mm. longi.

BRITISH EAST AFRICA. Kikumbuliu, *Scott Elliot*, 6,292; Makindu, *Kässner*, 584; *Linton*, 72; Baringo, 3,400 feet, *Johnston.*

809. **Eragrostis lasiantha**, *Stapf* [Gramineae], affinis *E. hispidae*, K. Sch.; differt panicula anguste contracta elongata, glumis glabris, valvis a medio sursum sensim attenuatis a latere visis lanceolatis longius pilosis.

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Gramen perenne, ultra 45 cm. altum. *Culmi* erecti, stricti, tenues, laeves, glabri, paucinodi, internodio summo ad 30 cm. longo longe exserto. *Folia* superiora tantum nota glaberrima; vaginae arctae, tenuiter nervosae; ligulae ad marginem ciliolatam reductae; laminae filiformiter convolutae, tenuissime acutatae, ad 7·5 cm. longae, facie prominenter nervosae, in nervis et ad margines asperulae. *Panicula* contracta, angusta, ad 15 cm. longa, 1·2–1·8 cm. lata; rami solitarii, vel geminati, subcapillares, longiores ad 5 cm. longi, asperuli, ad 4–8 mm. indivisi, tunc parce ramulosi, ramulis 2–4-spiculatis, caeterum simplices; pedicelli tenuiter capillares, 2–8 (rarius ultra) mm. longi. *Spiculae* griseo-olivaceae, ambitu oblongae, ad 6 mm. longae, 8–11-florae; rhachilla gracilis, glabra, ab apice basin versus disarticulata. *Glumae* subaequales, anguste lanceolatae, acutissime acuminatae, 1·75–2 lin. longae, glabrae, hyalinae, 1-nerves. *Valvae* 2–2·25 mm. longae, a latere visae anguste lanceolatae, apice minute truncatae, subhyalinae, nervis conspicuis viridibus, in carina et prope eam minuti pilosae, extra nervos laterales longiuscule pilosae. *Paleae* a latere visae lineari-oblongae, quam valvae paulo breviores, in carinis longiuscule pilosae. *Stamina* 3; antherae vix 1 mm. longae.

BRITISH EAST AFRICA. Nairobi, Government Farm, *Linton*, 13.

810. **Eragrostis (§ Platystachya) poecilantha**, *Stapf* [Gramineae]; affinis *E. truncatae*, Hack.; differt vaginis omnibus ipsis infimis glaberrimis, valvis minoribus a latere visis oblique truncatis minus imbricatis.

Gramen perenne, caespitosum. *Culmi* subascendentes, cum turionibus foliatis fasciculati, simplices, glaberrimi, 3-nodi, cum paniculis ad 23 cm. longi, internodiis breviter exsertis. *Foliorum* vaginae arctae, glabrae, inferiores subcompressae, 1·8–2·5 cm. longae, prominule nervosae, infimae persistentes; ligulae ad marginem ciliatum redactae; laminae anguste lineares, complicatae, obtusiusculae, 3·5–5 cm. longae, explanatae ad 1–5 mm. latae, margine asperulae, supra villosulae, infra glaberrimae, prominenter pauci-nervosae. *Panicula* angusta, densa, 5–7·5 cm. longa, ad 1·25 cm. lata; rhachis gracilis, tenax, nervoso-striata, laevis; rami solitarii, oblique erecti vel subpatuli, ad 8 mm. longi, simplices vel subsimplices, infimi 5–9-spiculati, superiores 4–2-spiculati, angulares, scaberuli, interdum flexuosi; pedicelli perbreves. *Spiculae* ovato-oblongae, 4–5 mm. longae, 2·5–2·6 mm. latae, 10–16-florae, purpureo-variegatae; rhachilla subflexuosa. *Glumae* subaequales (superior paulo longior), a latere visae lanceolatae, acutae ad 1·5 mm. longae, rigide tenuiter membranaceae, carina rigida scaberula. *Valvae* a latere visae semi-ovatae, apice oblique truncatae, 1·5–1·8 mm. longae, rigidae, apice scaberulae, nervis admodum prominentibus strictis fere excurrentibus. *Paleae* valvas subaequantes, carinis acutis scaberulis. *Antherae* ovato-oblongae, 0·6 mm. longae. *Caryopsis* ellipsoidea, ad fere 0·5 mm. longa, pallide brunnea.

TRANSVAAL. In grassy plains near Pietersburg, 4,000 ft. above sea-level, *Bolus*, 10,857.

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XIII.—NEW ORCHIDS.—DECADE 27.

261. **Bulbophyllum Kerrii**, Rolfe; aff. *B. hirto*, Lindl., sed sepalis brevioribus, petalis latioribus et minute crenulatis facile distinguenda.

Pseudobulbi subapproximati, oblongi, circa 4 cm. longi, diphylli. *Folia* oblonga, emarginata, subcoriacea, circa 7·5 cm. longa, 1·2 cm. lata. *Scapus* suberectus, 1–1·5 dm. longus, multiflorus. *Bracteae* ovato-oblongae, acutae, 2–3 mm. longae. *Pedicelli* pubescentes, 3 mm. longi. *Sepalum* posticum oblongum, acutum, concavum, pubescente, 6 mm. longum; sepala lateralia paullo breviora, caeteris similia. *Petala* late elliptica vel suborbicularia, obtusa, crenulata, pubescentia, circa 2 mm. longa. *Labellum* recurvum, oblongum, obtusum, carnosum, canaliculatum, puberulum, circa 2 mm. longum. *Columna* brevis, alis minutis.

SIAM. Mountains round Chiengmai, on deciduous trees at about 2,000 feet altitude, *Dr. Arthur Kerr*.

Sent to Kew for determination by Professor Henry H. Dixon, Trinity College, Dublin. It has also flowered at the Royal Botanic Gardens, Dublin, in January, 1901. The flowers are dull yellow and pubescent throughout, and the leaves are deciduous, as in the allied Indian species, *Bulbophyllum hirtum*, Lindl.

262. **Bulbophyllum capituliflorum**, *Rolfe*; habitu *B. intertexti*, Lindl., a qua differt floribus majoribus et in capitulam parvam aggregatis.

Rhizoma repens, subgracile. *Pseudobulbi* ovoidei, 6–8 mm. longi, monophylli. *Folia* elliptico-oblonga, apiculata, crassiuscula, subsessilia, 1·6–2·3 cm. longa, 5–6 mm. lata. *Scapi* graciles, 3–5 cm. longa; flores pauci et in capitulam parvam aggregati. *Bracteae* ovatae, acuminatae, 2 mm. longae. *Sepala* subacuta, minutissime puberula, 3 mm. longa; posticum elliptico-oblongum; lateralia ovata. *Petala* oblonga, subobtusa, 1 mm. longa. *Labellum* ovato-oblongum, recurvum, subobtusum, 1 mm. longum, carnosum, margine minute denticulato. *Columna* brevissima, dentes subulati, acuti.

WEST TROPICAL AFRICA.

Flowered in the Royal Botanic Garden, Glasnevin, in October, 1900, where it was received under the name of *Bulbophyllum intertextum*, Lindl., hence, although quite different from that species, it is supposed to have come from the same country. The sepals and petals are pale whitish green, with a suffusion of light purple brown towards the apex, and the lip deep lurid purple.

263. **Calanthe madagascariensis**, *Rolfe*; species *C. sylvatico*, Lindl., affinis, sed minor, foliis multo brevioribus, racemis brevioribus, et bracteis patentibus vel recurvis et multo brevioribus recedit.

Folia caespitosa, petiolata; lamina elliptico-ovata vel oblonga, acuta vel breviter acuminata, corrugata, paullo undulata, 8–15 cm. longa, 3–8 cm. lata; petiolus 2·5–7·5 cm. longus. *Scapus* erectus, 4·5–6 dm. altus, puberulus. *Racemus* pauci- vel multiflorus. *Bracteae* patentes vel recurvae, ovato-lanceolatae, acutae, 8–14 mm.

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longae. *Pedicelli* 1·2–2·5 cm. longi. *Sepala* et *petala* patentia, late elliptica, breviter acuminata, 1·2–1·4 cm. longa. *Labellum* basi columnae adnatum, lamina triloba, circa 1·2 cm. longa et lata, lobis lateralibus oblongis obtusis, lobo intermedio late obcordato vel bilobo, disco bituberculato et verrucoso, calcare gracili incurvo 2·5–3 cm. longo.—Gard. Chron. 1900, ii. 335 (nomen tantum); Bot. Mag. t. 7780. *C. sylvatica*, Rolfe in Journ. Linn. Soc. xxix. p. 52 (non Lindl.).

MADAGASCAR. *Warpur*; East Betsileo district, *Baron*, 254, 328, 2697, 6555; Fort Dauphin, *Scott-Elliot*, 2357.

Flowered in the Kew collection in August 1900, the plants having been presented by M. Warpur. Dried specimens had previously been doubtfully referred to the Mauritian *C. sylvatica*, Lindl., but it now proves even more distinct than the S. African *C. natalensis*, Reichb. f. (*Bot. Mag.* t. 6844), which was originally considered as a form of the same species. It is very variable in colour, as the plants now flowering include forms with pale purple, lilac, and pure white sepals and petals, while the lip varies from bright purple in the darker forms, becoming paler with age, to yellow in the white forms.

264. **Calanthe Warpuri**, *Rolfe*; ad *praecedenti* accedit, sed labelli lobis lateralibus parvis, lobo intermedio cuneato-unguiculato, calcare reflexo recedit.

Folia caespitosa, petiolata; lamina elliptico-ovata, acuta vel breviter acuminata, plicata, paullo undulata, 8–13 cm. longa, 3–5 cm. lata; petiolus 3–7 cm. longus. *Scapus* erectus, 1·5–2 dm. altus, puberulus. *Racemus* circa 8–12-florus. *Bracteae* patentes vel recurvae, oblongo-lanceolatae, acutae, 1–2·5 cm. longae. *Pedicelli* 1·2–1·5 cm. longi. *Sepala* et *petala* patentia, elliptico-lanceolata, acuta, 1·2–1·5 cm. longa. Labellum basi columnae adnatum, lamina triloba, circa 1 cm. longa, 7 mm. lata, lobis lateralibus parvis rotundato-oblongis obtusis, lobo intermedio obcordato-bilobo, basi cuneato-unguiculato, disco tricarinato carinis verrucosis, calcare gracili reflexo vel recurvo 1·5–2 cm. longo.—Gard. Chron. 1900, ii. 335 (nomen tantum).

MADAGASCAR. *Warpur*.

Flowered in the Kew collection in September, 1900, the plants having been presented by M. Warpur. The sepals and petals are pale lilac or white, tinged with light purple, and the lip dark purple with a deep yellow crest.

265. **Cattleya Jenmanii**, *Rolfe*; a *C. gaskelliano*, Sander, foliis multo latioribus, floribus multo minoribus distinctis.

Pseudobulbi clavati, subcompressi, basi attenuati, 1·5–1·7 dm. longi, 2·5–4 cm. lati, monophylli. *Folia* elliptico-oblonga, obtusa, crasse coriacea, 1·7–2 dm. longa, 5–8 cm. lata. *Spatha* oblonga, obtusa, conduplicata, 1–1·5 dm. longa. *Scapus* 2–3-florus. *Bracteae* lanceolatae, acutae. 6 mm. longae. *Pedicelli* 5–6 cm. longi. *Sepala* oblongo-lanceolata, acuta, 6–7 cm. longa. *Petala* ovata, obtusa, undulata, 6–7 cm. longa, 4–6 cm. lata. *Labellum* integrum, late ellipticum, retusum, undulatum, circa 6 cm. longum, circa 5 cm. latum; discus laevis. *Columna* clavata, circa 3 cm. longa.

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BRITISH GUIANA. Sources of the Mazaruni River, *Jenman*, 7750.

An interesting species of the *C. labiata* group, which was discovered by the late Mr. G. S. Jenman, Government Botanist, Georgetown, British Guiana, and has now appeared in cultivation, a plant sent home by Mr. Jenman having flowered in the collection of Miss Sinnock, Downford, Hailsham, Sussex. The flowers are rosy mauve, with the front lobe of the lip crimson, and the disc yellow with radiating red-brown veins.

266. **Pteroglossaspis argentina**, *Rolfe;* species americana, generis africani *Pteroglossaspidis* habitu et characteribus consimilis, *P. Carsoni*, Rolfe, affinis, sed segmentis brevioribus et latioribus distinctis.

Tuber ovoideo-oblongum, 2·5 cm. longum. *Folia* erecta, lanceolato-linearia, obtusa, basi in petiolum attenuata, circa 3·7 dm. longa, basi vaginis tubulosis 3 v. 4 imbricatis tectis. *Scapus* erectus, circa 6 dm. altus, basin ad apicem vaginis acutis laxis imbricatis tectis. *Racemi* circa 10-flori. *Bracteae* lanceolatae, acuminatae, striatae, 1·2–3 cm. longae. *Pedicelli* 6–10 mm. longi. *Sepala* et *petala* elliptico-oblonga, obtusa, subequalia, 6–7 mm. longa. *Labellum* trilobum, 6–7 mm. longum; lobus intermedius obovato-orbicularis, crenulatus, 5 mm. latus; lobi laterales divergentes, quadrato-orbiculares, 2 mm. lati; discus crassiusculus, obscure verrucosus. *Columna* lata, 4 mm. longa.

ARGENTINA. In praemont. saxos. valle Rio Primero, prope Cordoba, rara, *Stuckert*, 6435.

An extremely interesting plant when viewed from a geographical standpoint, for the four species of the genus hitherto known are all Continental African, and though specifically distinct from these it agrees precisely in habit and structure. Pfitzer's genus *Eulophidium*, perhaps better considered a section of *Eulophia*, has a somewhat analagous distribution, having one species in South Brazil, one in West Africa, a third in the Mascarene Islands, and a fourth in Natal.

267. **Catasetum** (§ **Pseudocatasetum**) **eburneum**, *Rolfe;* species anomalum, floribus eburneis sepalis petalisque reflexis labello crasso-carnoso et columna crassissima facile distinguenda.

Pseudobulbi oblongi, 5–8 cm. longi, 5–6-phylli. *Folia* elongato-lanceolata, acuminata, plicata, subtus verrucosa, basi attenuata, 3–3·7 dm. longa, 4–5 cm. lata. *Scapi* suberecti, 3 dm. alti, basi vaginis ovatis acutis obtecti, circa 7-flori. *Bracteae* ovato-oblongae, subacutae, 1·2–1·7 mm. longae. *Pedicelli* circa 4 cm. longi. *Sepala* reflexa, oblonga, apiculata, carnosa, circa 2·3 cm. longa. *Petala* reflexa, elliptico-oblonga, apiculata, carnosa, 2 cm. longa. *Labellum* superum, columnae basi adnatum, erectum, crasso-carnosum, ovato-ellipticum, obtusum, 2 cm. longum, margine integrum, basi late saccatum. *Columna* crassissima, circa 1 cm. longa et lata, ecirrhosa; anthera et pollinia normalia.

COLOMBIA. In the Pamplona district.

Imported from the *Cattleya Mendelii* district by Messrs. Charlesworth and Co., Heaton, Bradford, and flowered in their nursery

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in September, 1900. It is an anomalous species, quite unlike any other at present known in the shape and details of the flowers. The pollinia are normally developed and the stigma reduced to a narrow chink, so that the flowers are functionally males, though the column is exceptionally broad. The colour is ivory white, with the single exception of the sac of the lip, which is deep yellow and slightly spotted with brown.

268. **Aëranthes ramosa**, *Rolfe;* ab *A. dentiens*, Reichb. f., differt, scapis longissimis tenuioribus ramosis, floribus minoribus, segmentis parum acuminatis.

Folia oblonga, obtusa, inæqualiter et breviter biloba, 1·2–2 dm. longa, 2–4 cm. lata. *Scapi* 4·5–6 dm. longi, gracillimi, ramosi. *Bracteae* late ovatae, apiculatae, cucullatae, 4 mm. longae. *Pedicelli* 1·3–2 cm. longi. *Sepala* late ovata, breviter acuminata, 1·8–2·5 cm. longa. *Petala* late rhomboideo-ovata, breviter acuminata, 1·5–2 cm. longa. *Labellum* cordato-ovatum, acutum, 1·5–1·8 cm. longum; calcar clavatum, obtusum, 8–12 mm. longum. *Columna* lata, brevissima, alis semiovato-oblongis, obtusis.

MADAGASCAR. At Tananbe, *Warpur*.

Flowered with Mr. F. W. Moore, A.L.S., Royal Botanic Garden, Glasnevin, in October, 1901, and proves identical with a plant collected by Mr. Warpur. It is remarkable for its long, slender, branched scape. The flowers are dull olive-green in colour.

269. **Habenaria triquetra**, *Rolfe;* affinis *H. pectinatae*, Don, sed ovario triquetro v. fere trialato, labelli lobis subaequalibus, lobo intermedio non recurvo, et staminodiis linearibus facile distinguenda.

Planta circa 3–4·5 dm. alta. *Folia* radicalia patentia, ovato-lanceolata, subacuta, amplexicaulia, 2·5–7·5 cm. longa, 2–3 cm. lata; caulina patentia, oblonga v. oblongo-lanceolata, acuta, amplexicaulia, trinervia, parce glaucescentia, 6–10 cm. longa, 2–3 cm. lata; vaginae tetraquetrae. *Racemi* circa 10-flori. *Bracteae* foliaceae, supra sensim decrescentiae, 3–7·5 cm. longae. *Ovarium* subsessile, triquetrum v. fere trialatum, 1·5–2 cm. longum. *Sepalum* posticum elliptico-oblongum, apiculatum, circa 2 cm. longum, 8 mm. latum; lateralia oblique lanceolata, apiculata, circa 2 cm. longa, 5 mm. lata. *Petala* suboblique lanceolata, subacuta, circa 2 cm. longa. *Labellum* circa 2 cm. longum, trilobum; lobus intermedius oblongus, obtusus, 8 mm. longus; lobi laterales obliqui, extus profunde laciniati laciniis subcapillacei; calcar subcylindricum, circa 2 cm. longum, fauce paullo ampliatums. *Columna* lata; staminodia linearia, arcuata, 2 mm. longa; antherae canales incurvae, suberectae, 2 mm. longae; processus stigmaticis clavati, arcuati, 4 mm. longi.

SHAN STATES. *Hildebrand.*

Sent from the Shan States by A. H. Hildebrand, Esq., C.I.E., and flowered in the Kew collection in July, 1903. The plant is somewhat glaucous, the sepals are light green, and the petals and lip white.

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270. **Cynorchis villosa**, *Rolfe*; affinis *C. gibbosae*, Ridl., sed foliis non solitariis, inflorescentiis insigniter villosis, floribus minoribus, et calcare brevi facile distinguenda.

Folia elliptico-oblonga, acuta vel breviter acuminata, margine undulata, 1–1·5 dm. longa, 4·5–7·5 cm. lata. *Scapi* erecti, 1·5–3 dm. longi, plus minusve villosi, basi vaginis ovato-lanceolatis obtecti; racemi ovoideo-oblongi, 5–9 cm. longi, villosi, multiflori. *Bracteae* ovato-lanceolatae, acuminatae, villosae, 6–12 mm. longae. *Pedicelli* 1·2–2 cm. longi, villosissimi. *Sepalum* posticum ovato-oblongum, apiculatum, subcucullatum, extus villosum, 6 mm. longum; sepala lateralia ovato-oblonga, apiculata, concava, extus villosa, 6 mm. longa. *Petala* obliqua, glabra, 5 mm. longa, unilateraliter dilatata, crenulata, supra medium subito constricta, apice obtusa vel truncata. *Labellum* 5 mm. longum, late pandurato-oblongum, apice trilobum, lobis late rotundatis, disco laeve; calcar oblongum, inflatum, 5 mm. longum. *Columna* lata; antherae appendices 3 mm. longae.—*Bot. Mag.* t. 7845.

N.E. MADAGASCAR. Tananbe, in ravines, *Warpur*.

A striking species, on account of the very villous, many-flowered inflorescence. The flowers are lilac-purple, with the lip and the lower part of the petals white. The ovary is light green, but its hairs—like those of the back of the sepals—are lilac-purple. It flowered at Kew in September, 1901.

XIV.—MISCELLANEOUS NOTES.

Mr. THOMAS W. MAIN, a member of the gardening staff of the Royal Botanic Gardens, has been appointed by the Secretary of State for the Colonies, on the recommendation of Kew, Superintendent of Government Plantations, Selangor, Federated Malay States.

Mr. JOHN L. WILLIAMS, a member of the gardening staff of the Royal Botanic Gardens, has been appointed by the Secretary of State for the Colonies, on the recommendation of Kew, Curator of the Botanic Station, Lagos, in succession to Mr. E. W. Foster (p. 48).

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ROYAL BOTANIC GARDENS, KEW.

BULLETIN

OF

MISCELLANEOUS INFORMATION.

No. 4.] [1906.

XV.—COLA.

(*Cola acuminata*, Schott & Endl.)

LABOGIE COLA.

A general account of the Cola nut has been already given in the *Kew Bulletin* for 1890, pp. 253–260. In an article by Count Zech on the Cola of West Africa (*Mitth. a. d. Deutsch Schutzgebieten* xiv., p. 12, 1901) reference is made to the "Laboshi" Cola of West Africa, which is stated by him to be more prized by the Cola experts and traders of the Soudan than the Ashanti Cola. The Count mentions especially nine localities as providing this superior Cola, viz., Laboshi, Fashi, Yakudi, Gbaki, Patchiko, Kimbokun, Bete, Bitagi and Koda.

In January, 1904, specimens reached Kew from Mr. W. R. Elliott, Forestry Officer, Northern Nigeria, of the Cola found by him growing in the Labogie district of the province of Nupe in N. Nigeria. The letter accompanying the botanical specimens states that "this particular variety of Kola nut is in great demand "throughout the whole of Northern Africa, and it fetches locally "almost double the price of the kind with four or five cotyledons." The letter continues:—"The Kola plantations at Labogie and "other places in the district are situated in sheltered valleys at an "elevation of from 450 to 550 feet above the sea. The soil is a "deep, black, sandy loam, and is kept in a continuous state of "moisture by the streams that are found in each valley. Very "little care is taken of the trees, and they are found growing with "the Oil Nut Palm (*Elaeis guineensis*). The rainfall of the "district is probably between 40 and 50 inches, but not a drop of "rain falls from December to April."

On examination, the specimens forwarded by Mr. Elliott were found to belong to the genuine *Cola acuminata*, Schott & Endl.

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(not of K. Schum.). This species is identical with the Cola of Sierra Leone and Ashanti, although the seeds received from Labogie are rather below the average size of the Sierra Leone article.

The source of the "Laboshi," or Labogie Cola, was not previously known and its determination was only possible after a thorough revision, by Dr. O. Stapf, of the group of species to which *Cola acuminata* belongs.

Synonymy of Cola acuminata.

Some dubiety has arisen as to the authorship of the species *Cola acuminata*. The subjoined note, prepared by Dr. Stapf, which explains the circumstances that have led to the uncertainty, may be of use in preventing a recurrence of the confusion that has been a consequence of this dubiety.

"*Cola acuminata* was originally described as *Sterculia acuminata* by Palisot de Beauvois in Flora d'Oware et de Benin, I. (1805), p. 41, t. 24, from specimens collected in the old kingdom of Oware in Southern Nigeria. When in 1832, Schott and Endlicher established the genus *Cola* (Meletemata Botanica, p. 33), they transferred *Sterculia acuminata* to *Cola* as *C. acuminata*. This publication was evidently overlooked by R. Brown, who, in 1844, contributed a description of *Cola acuminata* to Bennett's Plantae Javanicae Rariores (p. 237). The contribution appeared there without an author's name and was therefore attributed to R. Brown by subsequent authors, as for instance in Flora of Tropical Africa, v. I., p. 220, Kew Bulletin for 1890, p. 253, and as recently as 1900 by K. Schumann in his Sterculiaceae Africanae, p. 125. The correct reference, however, is given in the Index Kewensis.

"Another complication was introduced into the nomenclature of the group of species to which *Cola acuminata* belongs, by K. Schumann's assumption that the *Sterculia* of Palisot de Beauvois was not the source of the so-called 'true Cola' of Sierra Leone, which he described accordingly as a new species under the name of *Cola vera* (in Notizblatt des Botanischen Gartens u. Museums zu Berlin, III. (1900), pp. 10–18).

"Palisot de Beauvois's figures, particularly that of the embryo which shows two large cotyledons, leave, however, no doubt that he meant what is now known as 'true Cola,' so that *Cola vera*, K. Schum. has to be considered as a synonym of *Cola acuminata*, Schott & Endl."

The Cola Industry of the Gold Coast.

Dr. Gruner, District Commissioner, Togoland, who visited the Gold Coast in August, 1903, on behalf of the German Colonial Agricultural Committee, for the purpose of obtaining information regarding the Cocoa and Cola industries in that Colony, published an interesting report on his visit in *Der Tropenpflanzer*, August, September, October, 1904. A précis of this report drawn up by

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Mr. W. H. Johnson, F.L.S., Director of Agriculture, Gold Coast, has just been issued by the Government of the Gold Coast Colony. The note dealing with Cola is as follows :—

"The cola tree is very seldom planted, and the tending of those "trees produced by natural agency is limited to the clearing away "of bush and weeds; but every such tree has an owner, who "claims this right in virtue of having effected the first clearing.

"Cola trees raised from seed commence to fruit when six or "seven years old; produce is small at this period, but increases "yearly until the tree is mature, when it will yield from 40 to 50 "fruits.

"Two crops are produced annually, in December and April, of "which the former is the principal. Fruits which fall off the "trees are not collected, as they spoil rapidly; those plucked from "the trees are stored in the shade, as the hot sun turns them "black. When the nuts are freshly gathered some difficulty is "experienced in skinning them, but if they are stored for a short "time, the skin can be readily removed with the fingers. If the "nuts harvested exceed the demand, the surplus is skinned and "packed with the leaves of a particular plant (*Thaumatococcus "Danielli*, Benth.) in broad baskets made of palm leaves, and "stored.

"The Hausas, who are the principal consumers, convey salt to "the cola districts and barter it for cola, 1 lb. of salt valued at 6*d*. "being exchanged for 100 cola nuts. The price of cola, in the "districts where it is produced, fluctuates between 3*d*. and 1*s*. per "100 nuts, but in Accra cost of transport raises it to 1*s*. 6*d*. per "100. Cola is principally exported by sea to Lagos; the value of "the exports in 1900 and 1901 were £43,133 and £35,024 respec- "tively, while the estimated annual value of the exports overland "to the hinterland is £75,000.

"The principal cola markets in Akim are Insuaim, Essamang, "Kwaben, Tumfa, and Kankan. In Kwaben or Tumfa it is "possible to purchase from a single person 10 loads containing "2,000 nuts each. Previously the cola produced in Ashanti was "only purchased by Hausas and transported by them northwards "to the Hausa States, but the restoration of order in Ashanti and "the completion of the railway to Kumasi has facilitated the "transport of this crop to the coast."

XVI.—FUNGI EXOTICI, IV.

The fungi described below are new species that have been recently received at Kew for identification. With the exception of one from the Tibetan Tableland all are species from South Eastern Asia. Those from Narcondam, a volcanic outlier of the Andaman group, some ninety miles to the east of Port Cornwallis in North Andaman, were collected by Mr. C. G. Rogers, F.L.S., of

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the Indian Forest Department. Those from Northern India (Dehra Dun), from Southern India (Mysore), and from Assam, were collected by Dr. E. J. Butler, F.L.S., Cryptogamic Botanist for India. Those from Singapore and from Christmas Island were collected by Mr. H. N. Ridley, F.L.S., Director of the Botanic Garden, Singapore. The species from Tibet was collected by the Lama Ujyen Gyatsko, who a number of years ago made a collection for Sir George King, K.C.I.E., then Superintendent of the Royal Botanic Gardens, Calcutta, at the instance of Sir Alfred Croft, K.C.I.E., Director of Public Instruction, Bengal.

AGARICACEAE.

Lepiota microspora, *Massee.*

Pileus carnosulus, convexus dein expansus, late umbonatus, pallidus, primo villoso-fibrillosus postea squamulis rufescentibus adpressis vestitus, 1·5–2 cm. latus. *Lamellae* liberae, subconfertae, angustatae, albae. *Sporae* anguste cylindraceo-ovatae, hyalinae, 4·5–5 × 2–2·5μ. *Stipes* brevis, 2 cm. longus, fistulosus, aequalis, basi bulbillosus, pallidus, infra annulum floccis albis cito deciduis primo vestitus.

ANDAMAN ISLANDS. Narcondam; on the ground, *Rogers.*

Distinguished at once from every known species by the very minute, subcylindrical spores; resembling in general appearance and stature *L. metulaespora*, Berk. & Broome.

Omphalia Rogersi, *Massee.*

Pileus membranaceus, tenax, convexo-umbilicatus, glaber, hygrophanus, striatus, ochraceus centro obscuriore, 1·5 cm. latus. *Lamellae* subdistantes, longe decurrentes, albidae. *Sporae* hyalinae, ellipsoideae, basi oblique apiculatae, 7–8 × 5μ. *Stipes* fistulosus, glaber, æqualis, deorsum castaneus, sursum pallidior, 4–5 cm. longus, 1 mm. crassus, basi radicatus, albo-lanosus.

ANDAMAN ISLANDS. Narcondam; on the ground, *Rogers.*

Allied to *O. camptophylla*, Berk., differing in the much more deeply decurrent gills, and the chestnut colour of the lower portion of the stem.

Panus ochraceus, *Massee.*

Pileus carnoso-lentus, tenuis, primo plano- dein expanso-depressus, subcyathiformis, testaceo-vel luridi-ochraceus, squamulis punctiformibus obsitus, aetate glabrescens, 4–6 cm. latus. *Lamellae* angustissimae, confertissimae, valde decurrentes, albae dein pallide ochraceae, acie integra. *Sporae* subcylindraceae, hyalinae, 7–8 × 4–5μ. *Stipes* solidus, excentricus aut fere lateralis, squamulis ochraceis obtectus, 2–3 cm. longus, 4–6 mm. crassus.

NORTHERN INDIA. Dehra Dun; fasciculate on dead wood, *Butler*, n. 397.

Allied to *Panus torulosus*, Fr., differing in the narrower, more densely crowded gills and smaller spores.

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Leptonia altissima, *Massee.*

Pileus tenuis, primo convexus dein plano-umbonatus, interdum depressus, cinereus, fibrillis obscurioribus virgatus, 4–7 cm. latus. *Lamellae* distantes, posticae sinuato-adnexae, uncino decurrentes, ex albo coerulescentes. *Sporae* subglobosae, basi oblique apiculatae, 7 — 8 × 6–7μ. *Stipes* altissimus, 9–14 cm. longus, sursum attenuatus, subfibrillosus, cinereus, cavus.

MALAYA. Singapore Botanic Garden; on the ground, *Ridley*, No. 4.

One of the largest and most beautiful of species included in the genus *Leptonia*. Allied to *L. chalybea*, Pers., and *L. euchroa*, Pers., in the colour of the gills and silky pileus.

Psilocybe tibetensis, *Massee.*

Pileus submembranaceus, campanulatus, dein expansus, glaber, udus viscidulus, griseus centro brunneus vel rufescens, margine primo involutus et albo-pruinatus, 3–4 cm. latus. *Lamellae* confertae, ventricosae, postice rotundato-adnexae. ex purpureo fuscescentes. *Sporae* ovatae, brunneae, 13 × 5 — 6μ. *Stipes* fistulosus, subaequalis, concolor, glabrescens, 2·5–3·5 cm. longus.

TIBET. Between Phari and Shigatse; growing on sandy ground, *King's collector*, No. 167.

Most closely allied to *P. cano-rubra*, Berk. & Broome, which differs in the striate margin of the pileus and much smaller spores.

POLYPORACEAE.

Polystictus villosus, *Massee.*

Pileus semiorbicularis, convexo-applanatus, sessilis, villosus, pallidus, zonis discoloribus variegatus, margine albicans, 3–5 cm. latus. *Tubuli* rufescenti-ochracei, curti; pori concolores, rotundati, minutissimi. *Sporae* obovatae, hyalinae, basi truncatae 7–8 × 5μ.

NORTHERN INDIA. Dehra Dun. SOUTHERN INDIA. Mysore; on dead branches, *Butler*, Nos. 243 and 415.

The present species possesses many features in common with *Polystictus Feei*, Fr., differing in the villose pileus, shorter tubes and smaller pores. Flesh of pileus quite thin, whitish.

Poria chlorina, *Massee.*

Sporophorum latissime effusum, chlorinum vel flavo-viride, margine albidum, subfimbriatum, demum evanescens; subiculum tenue, submembranaceum. *Pori* majusculi, subangulati, ore primo integro demum lacerato. *Sporae* ovatae, hyalinae, 6 × 3 — 3·5μ.

CHRISTMAS ISLAND. On dead wood, *Ridley*, No. 344.

The general habit is that of *P. vaporaria*, Fr., distinguished by the clear yellowish green colour, and somewhat angular, not sinuous pores.

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Daedalea suberosa, *Massee.*

Pileus suberosus, dimidiatus, suborbicularis, sessilis, tennis, margine acutus interdum lobatus, ochraceus, zonis concoloribus, glabriusculus, 4–6 cm. latus. *Pori* in sinulos subcontortos vel lamellosos labyrinthiformes abeuntes, acie obtusa. *Sporae* ovatae, hyalinae, 5–6 × 3μ.

SOUTHERN INDIA. Mysore; on wood, *Butler*, Nos. 399, 400.

Allied to *D. tenuis* Berk, from which it is distinguished by the almost glabrous pileus, clear ochraceous colour, and much thicker dissepiments with an obtuse edge.

THELEPHORACEAE.

Stereum papyraceum, *Massee.*

Pileus papyraceus, sessilis, convexo-planus, triqueter, postice angustatus, obscure brunneus, obsolete zonatus, setoso-hirtus, margine acuto patente. *Hymenium* nudum, laeve, glabrum, cinereo-lividum, purpurascens. *Sporae* ellipsoideae, hyalinae, basi apiculatae, 6–7 × 4–5μ.

ASSAM. Khasia Hills at Wajhain; on dead wood, *Butler*, No. 380.

A well marked species, readily distinguishod by the dusky colour of every part; the hispid pileus, and more especially by the thin, papery texture. Allied to *S. pannosum*, Cke., a native of New Zealand; in the latter, however, the pileus is glabrous, and the texture thicker and firmer; the spores are also larger than in *S. papyraceum.*

Auricularia Butleri, *Massee.*

Pileus coriaceo-gelatinosus, tenuis, flaccidus, effusus, reflexus, sericeus, cinnamomeus, zonis concentricis discoloribus variegatis, margine lobato. *Hymenium* rugulosum, glabrum, nudum, e cinereo-nigro purpurascens. *Sporae* subcylindraceae, curvulae, hyalinae, basi oblique apiculatae, 10–11 × 5μ.

NORTHERN INDIA. Dehra Dun; on dead wood, *Butler*, No. 255A.

A very distinct and beautiful species, sometimes imbricated and extending laterally for a considerable distance. Most nearly allied to *A. mesenterica*, Fr., which differs in the absence of a lobed margin, non-rugulose hymenium and very much larger reniform spores.

XVII.—AGRICULTURE AND THE EMPIRE.

Under this title the subjoined valuable article, from the pen of Sir W. T. Thiselton-Dyer, appeared in the issue of *Nature* for March 22, 1906 :—

"*Nature* for January 11 contains a short paper on a large "subject. Seeing that the cultivation of the soil, or Agriculture,

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"is the fundamental condition of human existence with any "approach to civilisation, large is a very moderate description.

"I take it that the object of the writer was to discuss the part "that the Home Country should play in advancing agriculture in "the Empire at large. That this is a matter which seems to me "important enough to receive a little discussion. It is one with "which I have been a good deal occupied during the past thirty "years. I should like therefore to attempt to define the present "position of the problem a little more precisely.

"May I begin with a very obvious remark: Agriculture is a "sort of 'noun of multitude.' There is undoubtedly only one "agricultural science based on physiological principles: there are "many agricultural 'arts' based on the application of that science, "whether empirical or otherwise, to widely different physical "conditions. The agriculture of the Lothians differs widely from "that of Bengal, and both differ from that possible on the Gold "Coast. This will seem to many an absurdly trite remark. "Nevertheless, experience shows that it represents a fact which "has often been overlooked with loss and disappointment as the "result.

"It may, I think, be confidently stated that arable cultivation "has been brought in the British Isles to a pitch of perfection "which is not surpassed anywhere in the world. It is, however, "an 'intensive' and highly specialised agriculture. This is "readily illustrated by the yield of wheat per acre. On land of "prairie value where the nitrogen removed is balanced by that "received from the atmosphere it has been shown at Rothamsted "that the yield is roughly some ten bushels or less. This actually "represents the state of things in the great wheat-growing countries "from which we draw our supplies:—Argentina, Australia, India "and Russia, and the United States with 13 bushels are not much "better. The yield of the United Kingdom for the five years "preceding 1904 was 31 bushels, and this was only surpassed by "that of our antipodal colony New Zealand, 32.

"This is largely due to the scientific research in agriculture for "which, I think, it may be fairly claimed this country has always "been pre-eminent. I by no means think that it is exhausted. "I remember Sir John Lawes saying to me that having devoted "half a century to the study of the soil actually cultivated, he "was still absolutely ignorant as to the subsoil and the part "played by it. Our knowledge of the action of manures is "mainly empirical and we have still to learn much of its physio-"logical significance, Without this it cannot be said that we "possess a rational theory of manuring. Farmers must have "wasted enormous sums in the application of nitrogenous "manures till Frankland showed that a considerable proportion "passed off unused in the drain-water.

"I must confess that I am not clear that the arable agriculture "of the United Kingdom is in a backward condition, that it does "not compare favourably with that of other countries, or that it "stands in urgent need of Government aid in regard to research. "Its theoretical principles can be taught in our Universities and "schools: its practice can only be learnt on the farm. While

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"saying this I must also express my conviction that the agri-
"cultural wealth of this country might be increased in many
"ways. In my evidence before the recent Departmental Com-
"mittee on Fruit Culture I expressed a strong opinion that the
"condition of that industry was in no way creditable to us.

"At the moment, where, so to speak, the shoe pinches is not
"above but below. There is no dearth of scientific knowledge in
"the country, but it floats on the surface and does not permeate.
"The scientific and even practical ignorance of the small cultivator
"is profound. The Board of Agriculture and Fisheries has tried
"to grapple with this by the wholesale distribution of carefully
"prepared leaflets. But such a method of disseminating know-
"ledge is of almost heart-breaking difficulty. I have had pre-
"pared at Kew a series of diagrams illustrating the diseases of
"trees, suitable for schools. The *Daily Graphic* was good enough
"to say that:—'This publication is equal to the very best of those
"'ever sent out by the United States Department of Agriculture.'
"Yet the sale has been disappointing and the Board of Agriculture
"and Fisheries does not see its way in consequence to proceed
"with the further and still more needed series dealing with the
"Diseases of Fruit Trees. The crying need, in my judgment, at
"the moment is the introduction of intelligent cultural instruction
"into rural elementary schools.

"If we turn to India we have to face a difficult problem. The
"revenue is dependent on the land, and this in turn has to
"support a constantly increasing population. It has been sup-
"posed that this might be met by the use of British methods.
"But how? Sir James Caird, who was sent out to study the
"problem on the spot, reported that if the produce of the land
"could be increased by one bushel per acre, all would be well.
"No doubt, but how is this intensive cultivation to be accom-
"plished? Long cultivation has brought the land down to a
"condition of nitrogen-equilibrium. Dung is used as fuel and
"the cultivator is too poor to import artificial manures.

"In 1900 I attended a conference at the India Office on the
"qualifications of an Inspector-General of Agriculture. The
"report of the proceedings is printed in the *Bluebook of the*
"*Botanical Work Committee* (pp. 77–78). I stated then and the
"statement met with general assent:—'It would be the greatest
"'mistake to substitute for Indian agricultural practices western
"'methods, merely because they had succeeded in the west. . . .
"'The problem in India was how best to graft the results of
"'scientific agricultural knowledge on to the stock (the really
"'valuable stock) of Indian agricultural practice and experience.'

"India has long had experimental farms in plenty. They
"have not been without their usefulness. But they have lacked
"permanence and a guiding principle. It now owes in great
"measure to the munificence of an American gentleman, an
"Agricultural Research Institute at Pusa. It is further, I believe,
"intended to establish a number of subordinate stations at a cost
"of £250,000. If these are to be staffed from home *forthwith* the
"result will be very much what the Transvaal Director of Agri-
"culture points out. The Government of India should at once

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"make up its mind what appointments it proposes ultimately to "make and inform the Universities at home five years in advance. "Students at the Universities cannot be expected to engage in "agricultural or allied studies unless they see clearly what is to "come of it at the end.

"Let me turn now to the problem presented by the West Indies "and other of our tropical possessions. Sir Daniel Morris is "quoted as saying in regard to the former:—'Agricultural "'education is at the root of the successful development of these "'Colonies.' This is perfectly true, only I rather doubt whether "the writer of the article quite understood the reason. In "temperate countries agriculture is a necessity of existence; in "many tropical it is not. The wasteful production of a few "ground provisions calls for the minimum of effort and is suffi- "cient to sustain indolence. But with the introduction of orderly "government a revenue becomes necessary. Sir Charles Bruce "has laid it down that:—'in the Crown Colonies generally . . . "'the only taxable fund is the wage fund supplied by the annual "'proceeds of the cultivation of the land' (*Proc. Colonial Institute*, "vol. xxxvi., p. 248). To induce the negro to engage in profitable "cultivation instead of contenting himself with a bare modicum "of ground provisions, provides a source of revenue, raises his "standard of comfort, and makes for his moral progress. But he "has to be taught by example how to do it and this is the agri- "cultural education which Sir Daniel Morris had in his mind. It "is widely different from anything of the kind in the country.

"In point of fact Tropical Agriculture has little relation to that "of Temperate countries. Its methods are those of Horticulture: "it is essentially extended gardening. For the supply of men for "this purpose our agricultural colleges would be of little or no "use. The problem has had to be met in a wholly different way. "The machinery for the purpose is compendiously described in "the following extract from the *Colonial Office List* (p. xx.):— "'Botanic Stations . . . are small and inexpensive gardens, "'devised in 1885, in order to afford practical instruction in the "'cultivation of tropical crops, and were intended to develop the "'agricultural resources at first of the smaller West Indian "'Islands, and subsequently (1887) of British possessions in Tropical "'Africa. Each is in charge of a Curator, who is a gardener "'trained at Kew.' The sort of success that has attended the "system may be illustrated by a single example. Cacao was "introduced to the Gold Coast from Kew. In 1891 the export "was valued at £4. In 1900 I was able to exhibit at the Paris "Exhibition from the Botanic Station the first sample, to the best "of my belief, grown on the African continent when it received a "bronze medal. In 1904 the export had risen to a value of over "£200,000. In effect Cacao is exchanged for imported goods; "besides thus adding to the comfort of the cultivators, it enables "them to pay the taxes necessary to maintain peaceful government.

"For work of this kind the Empire has to depend on Kew "which is organised for the purpose as an advanced horticultural "school. At the present moment some seventy Kew men are in "official employment and carrying on the work I have described "in our various tropical colonies and possessions.

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"But besides native peasant cultures British capital and enter-
"prise are also largely embarked in the tropical regions of the
"Empire in 'planting industries.' These meet with difficulties
"which the local Government can and does supply skilled aid to
"mitigate. Most of the West Indian Colonies have a 'Government
"'Analyst.' Cambridge has secured the traditional right to train
"and supply these. Incidentally they are able to give important
"aid in dealing with agricultural problems. The value of the
"work done by Professor Harrison in British Guiana, and Pro-
"fessor d'Albuquerque in Barbadoes can hardly be over-estimated.

"Ceylon possesess an almost unique staff of trained experts
"of every kind at Peradeniya, and a similar organisation is in
"process of establishment in the Federated Malay States. The
"rubber industry of the Straits Settlements owes its success to
"the Director of Public Gardens at Singapore. Besides Pusa,
"India has experienced botanical experts, all University men, at
"Calcutta, Madras and Saharunpore.

"Our self-governing colonies know pretty well how to take
"care of themselves. All possess Agricultural Departments and
"produce Journals which will compare more than favourably
"with anything at home. In Canada the Central Experimental
"Farm at Ottawa is certainly not eclipsed by any institution in
"the United States. I may be pardoned a little vanity if I
"remark that when the Transvaal Government applied to
"Washington for an Agrostologist, it received a Kew man.

"To sum up:—What the Home country can supply to the
"Empire is:—(i.) cultural instructors such as are trained for
"the purpose at Kew, (ii.) men with a sound scientific training
"and a firm grasp of the principles underlying agricultural
"practice of whatever kind, and for these we must look to the
"Universities. Men who are merely familiar with British agri-
"cultural conditions will be mostly of little use unless they
"possess the flexibility of mind which will apply theory to new
"and unfamiliar conditions."

XVIII.—DIAGNOSES AFRICANAE, XVI.

811. **Polygala latipetala,** *N. E. Brown* [Polygalaceae]; affinis *P. tenuifoliae,* Link, sed floribus multo minoribus facile distinguitur.

Planta multicaulis. *Caules* 15–25 cm. longi, erecti, graciles, virides, minutissime puberuli. *Folia* alterna, 6–17 mm. longa, 1–1·5 mm. lata, linearia, acuta, glabra. *Racemi* terminales et pseudolaterales, 3–9 cm. longi. *Bracteae et bracteolae* 1 mm. longae, ovatae, subacutae, concavae, deciduae. *Pedicelli* 2·5–3 mm. longi, minutissime puberuli. *Sepala* 2 mm. longa, inferiora connata. *Alae* 4 mm. longae, 3 mm. latae, ellipticae, obtusae, virides, margine roseo-purpureo. *Petala* lateralia 4 mm. longa, 5 mm. lata,

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latissime cuneato-obovata, apice truncato-rotundata, purpureo-caerulea, glabra. *Carina* 6·5 mm. longa, 2·5 mm. lata, obtusa cristata, purpureo-caerulea. *Capsula* 4·5 mm. longa, 3 mm. lata oblonga, apice breviter bifida, obtusa, glabra. *Semina* strophiolata dense albo-sericea.

RHODESIA. Mashonaland, between Umtali and Salisbury, *Hon. Mrs. Evelyn Cecil*, 45.

812. **Abutilon Cecili,** *N. E. Brown* [Malvaceae-Malveae]; affine *A. Rehmanni*, Baker f., sed carpellis apice rotundatis differt.

Frutex ramis velutinis et pubescentibus. *Folia* rotundato-cordata, obtuse acuminata, grosse crenato-dentata, supra viridia, pubescentia, subtus velutino-tomentosa cum pilis longioribus munita, 5–6·3 cm. longa, 5 cm. lata, petiolis 2·5–4 cm. longis. *Flores* axillares, subfasciculares. *Pedicelli* 2–3·5 cm. longi, breviter villoso-pubescentes et velutini. *Calyx* ad medium 5-lobus, velutino-tomentosus, lobis ovatis acutis. *Corolla* 2·5 cm. diam., alba, basi rubro-purpurea. *Columna staminea* rubro-purpurea, ad medium parce pubescens. *Carpella* apice obtuse rotundata, dense tomentosa.

RHODESIA. Manika District, on the Inyanga Mountains, 1800–2100 m., *E. Cecil*, 196.

813. **Hibiscus mutatus,** *N. E. Brown* [Malvaceae-Hibisceae]; affinis *H. Carsoni*, Baker, sed elatior ramosior et foliis elliptico-ovatis nec 3-nervatis differt.

Frutex ramosus, 1–1·3 m. altus, ramis pilis stellatis scabridis. *Folia* parva, breviter petiolata, 8–12 mm. longa, 6–12 mm. lata, elliptica vel elliptico-ovata, crenato-dentata, utrinque scabrida. *Stipulae* parvae, subulatae. *Pedicelli* 8–17 mm. longi, scabridi. *Bracteolae* 7, lineari-subulatae, 2–4 mm. longae. *Calyx* profunde 5-lobus, scabridus, lobis 4–6 mm. longis, 1–1·3 mm. latis, linearibus, subobtusis. *Corolla* primum alba, mox carnea vel rosea, petalis 2 cm. longis, suberectis, obovatis, extra sparse stellato-pubescentibus. *Styli* 5, e columna staminea longe exserti. *Capsula* globosa, 6–8 mm. diam., puberula.

RHODESIA. Matabeleland, on the Matoppo Mountains, *Hon. Mrs. Evelyn Cecil*, 108.

814. **Melhania obtusa,** *N. E. Brown* [Sterculiaceae-Dombeyeae]; affinis *M. acuminatae*, Mast., sed foliis obtusissimis obscure denticulatis differt.

Frutex ramis brunneo-tomentosis. *Folia* petiolata, 2–6 cm. longa, 1–2 cm. lata, oblonga vel sublanceolato-oblonga, subtruncata, basi rotundata, obscure denticulata, utrinque dense tomentosa, petiolis 6–8 mm. longis brunneo-tomentosis. *Stipulae* 5–9 mm. longae, subulatae. *Pedunculi* 2·5–4 cm. longi, biflori, brunneo-tomentosi. *Sepala* circa 10 mm. longa, 6 mm. lata, cordato-ovata, cuspidato-acuminata, dense tomentosa. *Petala* circa 12 mm. longa, obovata, lutea. *Staminodia* 8 mm. longa, 1 mm. lata, subspathulato-linearia, glabra, staminibus multo longiora. *Ovarium* dense albo-tomentosum.

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RHODESIA. Matabeleland, near Buluwayo, *Hon. Mrs. Evelyn Cecil*, 94.

815. **Hermannia Gilfillani**, *N. E. Brown* [Sterculiaceae-Hermannieae]; affinis *H. linearifoliae*, Harv., sed stipulis longioribus et lobis calycis latioribus obtusioribus differt.

Frutex ramosus, lignosus. *Rami* minutissime stellato-puberuli. *Folia* fasciculata, 3–10 mm. longa, 0·5–1 mm. lata, linearia, subobtusa, canaliculata, rigidula, glabra. *Stipulae* 2·5–7 mm. longae, foliis similes. *Flores* pauci, terminales. *Pedunculi* 1–1·5 mm. longi, 1–2 flori, bibracteolati, minutissime tomentelli. *Bracteae* 1–1·5 mm. longae, lineares, acutae. *Pedicelli* 1–1·5 mm. longi. *Calyx* latissime infundibularis, 5-lobus, minute stellato-puberulus: tubus 2·8 mm. longus, 4·5–5 mm. latus; lobi 2·5–3 mm. longi, 3 mm. lati, late deltoidei, acuti, patentes. *Petala* arcte convoluta, 8·5 mm. longa, 5 mm. lata, orbiculata, obtusissima, abrupte unguiculata, rubro-purpurea, glabra; unguis subconvoluto-tubulosus, apice utrinque fasciculo parvo pilorum minutorum instructus. *Stamina* inclusa; filamenta 2·5–3 mm. longa, 1 mm. lata, oblonga, acuta, basi ad $\frac{1}{3}$ connata, pilis minutissimis stellatis paucis ciliata; antherae 2 mm. longae, lanceolatae. *Ovarium* acute pentagonum, sessile, tomentellum: stylus 3 mm. longus, basi puberulus.

CAPE COLONY. Middelburg Division, at Conway Farm, 1100 m., *Gilfillan in Herb. Galpin*, 5506.

816. **Zygophyllum Gilfillani**, *N. E. Brown* [Zygophyllaceae]; affinis *Z. incrustati*, E. Mey., sed espinosum, foliolis latioribus et capsulis orbicularibus.

Frutex ramosissimus, cortice cinereo. *Folia* opposita vel quaterna, glabra; petiolus 1–1·5 mm. longus; foliola 4–6 mm. longa, 2–4·5 mm. lata, oblique elliptico-oblonga, obtusissima, uninervia. *Pedicelli* 4–9 mm. longi, minutissime puberuli. *Sepala* 3·5 mm. longa, 2 mm. lata, oblonga, obtusissima. *Petala* 5–6 mm. longa, 3–3·7 mm. lata, elliptico-obovata, obtusa, lutea. *Stamina* petalis breviora. *Squamae* 2 mm. longae, oblongae vel elliptico-oblongae, breviter fimbriatae. *Fructus* 6–7 mm. longus, 7 mm. latus, ambitu orbiculatus, utrinque retusus, pentapterus, apice apiculatus, glaber.

CAPE COLONY. Middelburg Division, Conway Farm, 1100 m., *Gilfillan in Herb. Galpin*, 5512.

817. **Pelargonium reliquifolium**, *N. E. Brown* [Geraniaceae-Geranieae]; affine *P. sidoidei*, DC., sed minus floribus albis.

Fruticulus ramosus. *Rami* petiolorum basibus persistentibus undique dense obsiti. *Folia* ad ramorum apices confertissima; petiolus 1·2–5 cm. longus, gracilis, minutissime velutinus; lamina 9–17 mm. longa et lata, suborbiculata, obtusissima, basi cordata, subintegra, minute crenulata, utrinque minutissime velutina, subtus pallida; lobi basales late rotundati, contigui vel imbricati. *Inflorescentia* laxe et pauce ramosa. *Umbellae* 3–5-florae. *Bracteae* 5–7, lineares vel oblongae, acutae, puberulae, 4–5 mm. longae,

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1–1·5 mm. latæ. *Pedicelli* 1–3 cm. longi, puberuli. *Sepala* inaequalia, 4–5·5 mm. longa, 1–1·5 mm. lata, lineari-lanceolata, acuta, puberula, inferiora reflexa. *Petala* 5, leviter inaequalia, cuneato-obovata, obtusa, circa 1 cm. longa; superiora 3 mm. lata, alba, inferne rubro-venosa; inferiora 4–5 mm. lata, omnino alba. *Stamina* 7, omnia perfecta. *Carpella* pilosula.

CAPE COLONY. Middelburg Division, Rosmead Junction, 1200 m., *Sim in Herb. Galpin*, 5632.

818. **Oxalis densa**, *N. E. Brown* [Geraniaceae-Oxalideae]; species distinctissima, affinis *O. bifurcae*, Lodd., sed acaulescens.

Herba pusilla, acaulis, bulbosa? *Folia* dense conferta, trifoliolata; petioli 1–2 cm. longi, graciles, parce pilosi; foliola 4–5 mm. longa, ad medium biloba, basi cuneato-acuta, supra glabra, subtus laxe pilosa, ciliata; lobi 2–3 mm. longi, 0·7–1·5 mm. lati, lineari-oblongi, obtusi, divergentes. *Pedunculi* petiolis subaequales vel breviores, 10–17 mm. longi, prope basin articulati, prope apicem bibracteati, inferne glabri, apice breviter pilosi. *Bracteae* 1·5 mm. longi, filiformes. *Sepala* 4 mm. longa, 1·5 mm. lata, lanceolata, obtusa, nigro-purpureo-lineata, exteriora dorso laxe pilosa vel ciliata, interiora glabra apice ciliata. *Corolla* 15–17 mm. longa, alba vel lutea?, nigro-purpureo-lineata, plus minusve pubescens. *Stamina* inaequalia, glabra, edentata.

CAPE COLONY. Calvinia Division, at Brand Vley, *Johanssen*, 9.

819. **Impatiens Cecili**, *N. E. Brown* [Geraniaceae-Balsamineae]; affinis *I. Mannii*, Hook. f., sed foliis acute serrulatis et calcare longiore facile distinguitur.

Caulis simplex, herbaceus, superne plus minusve pubescens. *Folia* petiolata, ovata vel elliptico-ovata, acuta, acute serrulata, utrinque glabra, laminis 3–4·5 cm. longis, 1·5–2 cm. latis, petiolis 6–15 mm. longis. *Flores* axillares, solitarii. *Pedicelli* 3–5 cm. longi, pubescentes vel fere glabri. *Sepala* 3, lateralia 4 mm. longa, 1·5 mm. lata, ovato-lanceolata, subulato-acuminata, inferius 1 cm. longum, subhemisphaericum, apiculatum, longe calcaratum, purpureo vittatum, calcare 2·5 cm. longo tenui procurvo. *Petala* 3, rosea, superius 6 mm. longum, suborbiculare, concavum, infra apicem emarginatum apiculatum, lateralia 17 mm. longa, circa 8 mm. lata, biloba, lobo basali oblique ovato acuto, lobo terminali oblique obovato obtuso.

RHODESIA. Manika District, by the side of a stream near Pangwe Falls, *E. Cecil*, 169.

820. **Indigofera Cecili**, *N. E. Brown* [Leguminosae-Galegeae]; affinis *I. eriocarpae*, E. Mey., sed floribus majoribus bracteisque longioribus differt.

Planta herbacea, 30–45 cm. alta, ubique foliolis supra glabris exceptis pilis basifixis tomentosa. *Caulis* 3 mm. crassus, striatus, foliosus. *Folia* 4–6·3 cm. longa, imparipinnata, foliolis 7–15 mm. longis, 3–7 mm. latis, ellipticis, obtusis, apiculatis. *Stipulae* 8·5–10·5 mm. longae, subulatae. *Racemi* 9–10 cm. longi, parte superiore dense floriferi. *Bracteae* subulato-filiformes, alabastris

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longiores, deciduae. *Pedicelli* 2 mm. longi. *Calycis* lobi inaequales, subulati, tomentosi, superiores 3 mm. longi, inferior 6 mm. longus. *Corolla* kermesina (sicca purpurea), tomentosa; vexillum 10–5 mm. longum, 6–7 mm. latum, ovato-oblongum, subtruncato-obtusum; alae 10 mm. longae, 3 mm. latae, oblanceolatae obtusae; carina circa 12 mm. longa, obtusa. *Legumen* immaturum breve, dense albo-tomentosum.

RHODESIA. Manika District, on the Inyanga Mountains, 1800–2100 m., common, *E. Cecil*, 186.

821. **Indigofera inyangana**, *N. E. Brown* [Leguminosae-Galegeae]; affinis *I. rostratae*, Bolus, sed floribus minoribus vexillo suborbiculari alisque latioribus differt.

Planta herbacea, 20–25 cm. alta, caulibus foliis subtus, pedunculis calycibusque pilis albis et brunneis medio affixis tenuiter appresse pubescentibus. *Folia* approximata, 8–15 mm. longa, imparipinnata, 7–13-foliolata, foliolis oppositis, 5–8·5 mm. longis, 2 mm. latis, oblongis, utrinque subobtusis, mucronulatis, supra glabris. *Stipulae* 2 mm. longae, subulatae. *Racemi* axillares, 7·5 cm. longi, parte florifera 2·5 cm. longa. *Bracteae* 4 mm. longae, linearisubulatae. *Pedicelli* 2–2·5 mm. longi, nigro-pubescentes. *Calyx* profunde 5-lobus, nigro-pubescens, lobis subulatis, superioribus 1·5 mm. longis, inferiore 2·5 mm. longo. *Corolla* kermesina; vexillum 7 mm. longum, 6 mm. latum, suborbiculare, retusum, extra nigro-pubescens; alae 6 mm. longae, 2·5 mm. latae, oblique subspathulato-obovatae, glabrae; carina 7 mm. longa, obtusa, brunneo-pubescens.

RHODESIA. Manika District, Inyanga Mountains, *E. Cecil*, 174.

822. **Indigofera notata**, *N. E. Brown* [Leguminosae-Galegeae]; affinis *I. Zeyheri*, Spreng., sed racemis quam foliis vix longioribus differt.

Fruticulus ramosus. *Rami* graciles, angulati, pilis medio affixis minutissimis appresse pubescentes. *Folia* 10–13 mm. longa, imparipinnata; rachis 5–6 mm. longa, ad axillas foliolorum fasciculis pilorum brunneorum ornata; foliola opposita, 3–4 juga, 4–10 mm. longa, 1·5–2·5 mm. lata, lineari-oblanceolata, obtusa, basi acuta, supra glabra, subtus appresse pubescentia. *Stipulae* minutissimae, deltoideae. *Racemi* 1–1·5 cm. longi, supra-medium 4–6-flori. *Bracteae* minutissimae. *Pedicelli* 1·5–2·5 mm. longi, appresse pubescentes. *Calyx* vix 2 mm. longus, late campanulatus, ad medium 5-dentatus, extra appresse pubescens; dentes deltoidei, acuti. *Corolla* rubra vel rubro-purpurea; vexillum 5·5 mm. longum, 6 mm. latum, suborbiculare, extra appresse pubescens; alae 5 mm. longae, 3 mm. latae, oblique spathulato-obovatae, glabrae, apice minute ciliatae; carina 5·5 mm. longa, obtusa, dorso et marginibus ciliata.

CAPE COLONY. East London Division; Quigney, 60 m. *Schönberg in Herb. Galpin*, 2793.

823. **Dolichos lupiniflorus**, *N. E. Brown* [Leguminosae-Phaseoleae]; affinis *D. malosano*, Baker, sed foliis angustioribus, calyce 5-dentato et vexillo intra ecornuto differt.

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Herba circa 1 m. alta, ubique, corolla excepta, appresse pubescens. *Caulis* angulatus. *Folia* longe petiolata, trifoliolata, foliolis 3–5 cm. longis vel ultra, 10–17 mm. latis, oblongis vel lanceolato-oblongis, acutis, basi obtusis, utrinque sericeo-pubescentibus, venis marginibusque fulvis, stipellis subulatis. *Racemi* terminales, sessiles, 23–25 cm. longi, multiflori. *Bracteae* 5–6 mm. longae, subulatae, caducae. *Flores* ad nodos 2 vel interdum 4. *Pedicelli* 4–6 mm. longi. *Calyx* campanulatus, inaequaliter 5-dentatus, basi bibracteolatus, bracteolis 3 mm. longis, subulatis; tubus 3 mm. longus; dentes superiores 1·5 mm. longi, deltoidei, acuti, inferior 3·5–4 mm. longus, deltoideo-subulatus. *Corolla* glabra, violaceo-purpurea; vexillum 16 mm. longum, 10·5 mm. latum, obcordatum, intra ecornutum, ungue apice utrinque minute auriculato; alae 16 mm. longae, 5 mm. latae, oblique oblongae, obtusae, unguiculatae; carina 16 mm. longa, 4 mm. lata, obtusa. *Ovarium* ad suturas dense barbatum, stylo glabro, stigmate penicillato.

PORTUGUESE EAST AFRICA. By the railway between Beira and Massi Kessi, *Hon. Mrs. Evelyn Cecil*, 23.

824. **Rhynchosia reptabunda**, *N. E. Brown* [Leguminosae-Phaseoleae]; affinis *R. hirsutae*, Eckl. et Zeyh, sed corolla glabra facile distinguitur.

Caulis herbaceus, repens, pilosus. *Folia* petiolata, trifoliolata; petiolus 3–6 cm. longus, puberulus et laxe pilosus; foliola subaequalia, 3–4·5 cm. longa, 2·5–4 cm. lata, late ovata, obtusa, apiculata, basi leviter cordata, utrinque pubescentia; stipulae 7–11 mm. longae, 1·5–3 mm. latae, falcato-oblongae, subobtusae. *Pedunculi* axillares, 5–17·5 cm. longi, apice racemosi, 2–6-flori, pubescentes. *Bracteae* 4–5 mm. longae, 1 mm. latae, lanceolatae, acutae, pubescentes. *Pedicelli* 3 mm. longi, pubescentes. *Calyx* pubescens; tubus 3 mm. longus; dentes superiores 3–4 mm. longi, lanceolati, acuti; dens inferior 7 mm. longus, lanceolato-subulatus. *Corolla* glabra, lutea; vexillum 8·5 mm. longum, 5·5 mm. latum, late oblongum, emarginatum, unguiculatum; alae 7 mm. longae, 2 mm. latae, oblongae, obtusae, carinae adnatae; carina 8·5 mm. longa, obtusa. *Ovarium* dense tomentosum.

NATAL. Near Charlestown, 1500–1800 m., *Wood*, 5734.

825. **Eriosema distinctum**, *N. E. Brown* [Leguminosae-Phaseoleae]; affine *E. oblongo*, Benth., et *E. Kraussiano*, Meissn., sed foliis et floribus multo majoribus facile distinguitur.

Herba 10–23 cm. alta. *Rami* decumbentes, trigoni, fulvo-pubescentes, 2–4 foliati. *Folia* trifoliolata; petioli 6–20 mm. longi, subfulvo-pubescentes; foliola inaequalia, oblonga vel obovato-oblonga, obtusa, apiculata, viridia, utrinque tenuiter appresse pubescentia, intermedium 5–10·5 cm. longum, 2·5–3·5 cm. latum, lateralia minora. *Stipulae* 12–20 mm. longae, 3–4 mm. latae, lanceolatae, acuminatae, striatae, molliter pubescentes. *Pedunculi* 10–18 cm. longi, subtrigoni, appresse pubescentes, inferne nudi, superne dense racemoso-floriferi. *Bracteae* 6–10 mm. longae, 1–1·5 mm. latae, lanceolatae, longe acuminatae, pubescentes, reflexae. *Pedicelli* 3 mm. longi. *Calyx* campanulatus, 5-dentatus, pubescens; tubus

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3 mm. longus ; dentes 3–4 mm. longi, deltoideo-attenuati. *Corolla* rubra vel rubro-purpurea, 12–17 mm. longa ; vexillum late orbiculato-obovatum, pubescens et glandulosum.

NATAL. On a stony hill near Nottingham Road Station, 1500 m., *Wood*, 4398 ; without precise locality, *Wood*, 6357.

826. **Eriosema longipes**, *N. E. Brown* [Leguminosae-Phaseoleae] ; affine *E. Burkei*, Benth., sed foliis tenuioribus minus tomentosis et pedunculis valde compressis differt.

Herba 45 cm. alta., basi decumbens laxe ramosa. *Rami* erecti compresso-subtrigoni, puberuli vel appresse pubescentes, striati, foliosi. *Folia* brevissime petiolata, trifoliolata, infima simplica ; petioli 2–4 mm. longi ; foliola 6–9·5 cm. longa, 1·3–4 cm. lata, lanceolata vel oblongo-lanceolata, acuta, basi cuneata, viridia, utrinque tenuiter pubescentia. *Stipulae* 8–10 mm. longae, 1·5–2 mm. latae, subfalcato-lanceolatae, acuminatae, striatae. *Pedunculi* 15–20 cm. longi, foliis multo longiores, valde compressi, ultra medium nudi, superne racemoso-floriferi, puberuli, striati. *Bracteae* 4–5 mm. longae, 0·7 mm. latae, lanceolatae, longe acuminatae, concavae, valde reflexae, pubescentes. *Calyx* campanulatus, subaequaliter 5-dentatus, fulvo-pubescens ; tubus 3·5–4 mm. longus et latus ; dentes 2 mm. longi, deltoidei, acuti. *Corolla* lutea, 10 mm. longa ; vexillum oblongum, basi biauriculatum, reflexum, pubescens. *Ovarium* dense appresse que hirsutum.

NATAL. On a hillside near Pinetown, 300 m., *Wood*, 5709.

827. **Cucumis Cecili**, *N. E. Brown* [Cucurbitaceae] ; affinis *C. dipsaceae*, Ehrenb., sed foliis acutioribus et fructibus dense setulosis nec echinulatis differt.

Planta herbacea, caulibus petiolis pedunculis cirrhisque breviter setuloso-scabridis. *Folia* longe petiolata, ambitu orbiculata vel rotundato-ovata, leviter 5-loba, acuta, basi cordata, utrinque dense appresse pubescentia. *Flores masculi* fasciculati. *Pedunculus* filiformis, 10–13 mm. longus. *Calyx* campanulatus, setuloso-pubescens, tubo 3 mm. longo, lobis subaequalibus subulatis. *Corolla* 6 mm. longa, ad $\frac{2}{3}$ lobata, lutea, extra nervis setuloso-pubescens, lobis oblongis obtusis. *Staminum* filamenta glabra, ad medium tubi inserta ; antherae 1·5–2 mm. longae, connatae, breviter appendiculatae, loculis rectis minute pubescentibus. *Flores feminei* solitarii. *Pedunculus* circiter 2 cm. longus. *Ovarium* ellipsoideum, dense setulosum, 3-placentiferum ; stylus 2 mm. longus, disco cupulari insertus ; stigmata 1 mm. longa, crassa.

RHODESIA. Manika District, Inyanga Mountains, 1800–2100 m., *E. Cecil*, 225.

828. **Gardenia Saundersiae**, *N. E. Brown* [Rubiaceae-Gardenieae] ; affinis *G. Thunbergia*, Linn. f., sed floribus majoribus et lobis calycis lanceolatis acutis nec spathulatis differt.

Frutex ternatim ramosus, cortice cinereo. *Folia* terna, 2·5–6 cm. longa, 1·2–4 cm. lata, orbiculato-obovata vel oblanceolata, obtusissima, basi cuneata, utrinque glabra ; stipulae in annulum tricrenatum connatae. *Flores* sessiles terminales. *Calycis* limbus

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in tubum dentato-crenatum, 6–8 mm. longum, ciliolatum, supra ovarium productus, 8–10-costatus, pubescens, costis alatis; alae 12–20 mm. longae, 4–6 mm. latae, lanceolatae, acutae, superne liberae, erectae, glabrae. *Corolla* hypocrateriformis, 8–9 loba, primum alba, demum lutea, glabra; tubus 7–9·5 cm. longus, cylindricus, fauce ampliata; lobi 4–5 cm. longi, 2·5 mm. lati, subelliptici, obtusi, obliqui. *Stamina* inclusa. *Stylus* 7–9·5 cm. longus; stigma clavatum, pluri-costato-lobatum.

PORTUGUESE EAST AFRICA. Lebombo Mountains, *Saunders*.

Described from specimens received from Mrs. Katherine Saunders, which were raised at Tongaat, Natal, from seeds collected by her son, Mr. Charles Saunders, in the Lebombo Mountains in 1896.

829. **Plectronia Gilfillani**, *N. E. Brown* [Rubiaceae-Vanguerieae]; species foliis orbiculato-ovatis utrinque tomentosis distinctissima.

Frutex circa 1 m. altus, ramosus. *Ramuli* tomentosi, oppositi. *Folia* breviter petiolata, orbiculato-ovata vel elliptica, obtusa, utrinque dense velutino-tomentosa, 2·5–4 cm. longa, 2–4 cm. lata. *Cymae* parvae, axillares, breviter pedunculatae. *Pedicelli* 1–2 mm. longi, pubescentes. *Calyx* 1 mm. longus, subtruncatus, minute 5-dentatus, subglaber. *Corolla* circa 4 mm. diam., extra glabra, intra fauce parce subvillosa vel fere glabra; tubus vix 1 mm. longus; lobi 1·5 mm. longi, 1 mm. lati, ovati, acuti, patentes. *Fructus* glaber, didymus, late obcordatus, compressus, 2-spermus, vel abortu oblique oblongus, 1-spermus.

TRANSVAAL. On Jeppes Town Ridge, near Johannesburg, 1800 m., *Gilfillan in Herb. Galpin*, 6010.

830. **Fadogia obovata**, *N. E. Brown* [Rubiaceae-Vanguerieae]; affinis *F. ancylanthae*, Schweinf., sed foliis obovatis et floribus majoribus differt.

Caulis bifariam puberulus. *Folia* sessilia, opposita vel verticillata, 3–5 cm. longa, 2–3 cm. lata, cuneato-obovata, obtusa vel obtuse apiculata, basi acuta, utrinque glabra; stipula 1–4 mm. longa, e basi lato ciliato subulata. *Pedunculi* axillares solitarii, 1- vel dichotome 2-flori, 1–1·5 cm. longi, glabri. *Calyx* 2·5–3 mm. longus, glaber; limbus subnullus, truncatus. *Corolla* viridi-lutea, glabra; tubus circa 2 cm. longus, 6 mm. diam., curvatus; lobi 5–6, patentes, deltoideo-oblongi, acuti, 5–6 mm. longi, 2·5–3 mm. lati. *Antherae* breviter exsertae.

BRITISH CENTRAL AFRICA. Mashonaland; at Six-mile Spruit, near Salisbury, *Hon. Mrs. Evelyn Cecil*, 141. North Nyasaland and Upper Loangwa River, *Nicholson*.

831. **Cuviera minor**, *C. H. Wright* [Rubiaceae-Vanguerieae]; a speciebus reliquis differt foliis minoribus membranaceis.

Arbor parva. *Rami* cinerascentes. *Folia* ovata vel oblongo-ovata, acuminata, leviter inaequilateralia, basi rotundata vel breviter cuneata, glabra, nervis primariis utrinque circa 6, 11·5 cm. longa, 4·5 cm. lata; petiolus supra canaliculatus, gracilis; stipulae late

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triangulares, caducae. *Cymae* axillares, multiflorae, 4 cm. longae; bracteae oblongae, basi apiceque attenuatae, 8 mm. longae. *Calycis* lobi 5, subfoliacei, lanceolati, 8 mm. longi. *Corollae* tubus 4 mm. longus, intus prope basin annulo pilorum deflexorum instructus; lobi triangulares, caudato-acuminati, 1 cm. longi, extus pilosi, lutescentes. *Stamina* 5, ad sinum corollæ loborum affixa; antherae sagittatae, filamentis duplo longiores. *Ovarium* 5-loculare, loculis 1-ovulatis; stylus 8 mm. longus; stigma ampullaeforme.

WEST TROPICAL AFRICA. Gold Coast: Kinaha, *Johnson*, 646.

832. **Pavetta Cecilae**, *N. E. Brown* [Rubiaceae-Ixoreae]; affinis *P. radicanti*, Hiern., sed foliis angustioribus corolla multo longiore facile distinguitur.

Suffrutex 15–25 cm. altus, basi procumbens, radicans, superne ramosus. *Rami* lignosi, rufescentes, pubescentes. *Folia* opposita, breviter petiolata, apice ramorum conferta, 2–4 cm. longa, 4–10 mm. lata, lanceolata, subacuta, basi acuta, utrinque pubescentia. *Cymae* terminales, sessiles, 6–9-florae. *Pedicelli* 2–4 mm. longi, pubescentes. *Calyx* 4-dentatus, pubescens; tubus 1 mm. longus; dentes 1 mm. longi, acuti. *Corolla* alba, extra pubescens; tubus tenuis cylindricus, 3 cm. longus, 1–1·5 mm. diam.; lobi 4, patentes, 6 mm. longi, 1·5 mm. lati, lineari-oblongi, obtusi, apiculati. *Antherae* exsertae, 4–5 mm. longae, lineares, patentes vel recurvae. *Stylus* filiformis, longissime exsertus, 4·5 cm. longus vel ultra.

RHODESIA. Matabeleland, at Selukwe, *Hon. Mrs. Evelyn Cecil*, 124.

833. **Pavetta pumila**, *N. E. Brown* [Rubiaceae-Ixoreae]; affinis *P. Cecilae*, N. E. Brown, sed glabra foliis latioribus lobis calycinis sexties longioribus et corolla minore.

Suffrutex 15–20 cm. altus, basi procumbens, radicans, superne laxe ramosus. *Caules* vel rami erecti, cinerei, glabri. *Folia* opposita, breviter petiolata, 2·5–6·5 cm. longa, 1–2 cm. lata, oblanceolata, obtusa vel subacuta, basi cuneato-acuta, utrinque glabra; petiolus 2–3 mm. longus; stipulae latae, apiculatae. *Cymae* terminales, sessiles, pluriflorae. *Pedicelli* 3–6 mm. longi, puberuli. *Calyx* 4-lobus; tubus 1·5–2 mm. longus, medio constrictus, ad apicem puberulus; lobi 6 mm. longi, 1 mm. lati, lanceolati, acuminati, minute ciliati. *Corolla* 4-loba, glabra, alba; tubus 15 mm. longus, gracilis, cylindricus, 1–1·5 mm. diam.; lobi 6 mm. longi, 2 mm. lati, lanceolati, acuti. *Antherae* 5 mm. longae, lineares, exsertae, recurvae. *Stylus* filiformis, longissime exsertus, 4·5 cm. longus.

PORTUGUESE EAST AFRICA. In the swamps at Dondo, near Beira, *Hon. Mrs. Evelyn Cecil*, 249 !

834. **Psychotria Mahoni**, *C. H. Wright* [Rubiaceae-Psychotrieae]; ex affinitate *Grumileae Kirkii*, Hiern, ramis pubescentibus differt.

Rami teretes, 6 mm. diam., conspicue pubescentes, virides. *Folia* elliptica, apice basique acuta, 15 cm. longa, 5 cm. lata, supra glabra

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nitida, subtus (praecipue ad nervos) pubescentia; petiolus 2 cm. longus; stipulae triangulares, acutae, 12 mm. longae, deciduae. *Cymae* terminales, corymbosae; bracteae anguste lanceolatae; bracteolae nullae. *Calyx* cupularis, dentibus 5 minutis. *Corolla* dilute flava, 8 mm. diam.; tubus 6 mm. diam,; faux pilosa; lobi 4–5, ovati, leviter cucullati. *Stamina* inclusa; antherae ovoideae. *Stylus* exsertus.

BRITISH CENTRAL AFRICA. Linkangala Stream, *Mahon.* Flowered at Kew in May, 1902.

835. **Geophila Cecilae**, *N. E. Brown* [Rubiaceae-Psychotrieae]; affinis *G. Afzelii*, Hiern, sed minor foliis obtusioribus pedunculisque quam petiolis longioribus.

Herba parva. *Caulis* tenuis, repens, radicans, glaber. *Folia* longe petiolata, rotundato-cordata, obtusissima, glabra, petiolis 1·5–4 cm. longis, supra pubescentibus, laminis 2–3 cm. longis 1·5–3 cm. latis. *Pedunculi* foliis longiores, 2·5–5 cm. longi, graciles, puberuli. *Capitulum* 4-florum. *Involucri* bracteae 4, glabrae; duae exteriores majores, 5 mm. longae, 4 mm. latae, obovatae, acutae; interiores minores. *Calyx* glaber; limbus basi annulatus, 5-lobus, inter lobos minute denticulatus; lobi 1·5–2 mm. longi, lineares, acuti. *Corollae* albae tubus 4 mm. longus, cylindricus, extra puberulus, intra fauce dense barbatus; lobi 1·5–2 mm. longi, patentes, ovati, acuti, apice dorso gibboso-carinati. *Stamina* inclusa.

PORTUGUESE EAST AFRICA. In the swamps at Dondo, near Beira, under trees, *Hon. Mrs. Evelyn Cecil*, 254.

836. **Otiophora inyangana**, *N. E. Brown* [Rubiaceæ-Anthospermeae]; affinis *O. cupheoidi*, N. E. Brown, sed foliis ternis et corolla ad faucem barbata differt.

Herba perennis, 20–25 cm. alta. *Caules* erecti, trigoni, trifariam pubescentes. *Folia* terna, sessilia 1·5–2 cm. longa, 5–7 mm. lata, lanceolata, acuta, utrinque glabra. *Cymae* parvae ad apicem caulis subcapitato-congestae, multiflorae. *Pedicelli* 0·5–1·5 mm. longi, glabri vel subpuberuli. *Calycis* lobi valde inaequales, glabri; unicus 4–6 mm. longus, 0·5–1·5 mm. latus, lineari-lanceolatus, acutus; ceteri minuti. *Corolla* 5-loba, glabra, pallide caerulea; tubus 3–4 mm. longus, fauce barbatus; lobi 4 mm. longi, 0·5–0·7 mm. lati, lineares, subacuti, glabri. *Stamina* exserta; filamenta 3·5 mm. longa, glabra; antherae 1 mm. longae, lineari-oblongæ.

RHODESIA. Manika District; Inyanga Mountains, 1800–2100 m., *E. Cecil*, 203.

837. **Bothriocline inyangana**, *N. E. Brown* [Compositae-Vernoniaceae]; affinis *B. longipedi*, N. E. Brown, sed petiolis multo brevioribus, ramis cymorum gracilioribus, capitulis pedicellatis et involucro purpurascente facile distinguitur.

Caulis ramosus. *Rami* adscendentes, striati, pubescentes. *Folia* breviter petiolata, 4–6·5 cm. longa, vel ultra, 1·3–2·5 cm. lata, oblongo-lanceolata, acuta, basi cuneata vel subrotundata,

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argute serrata, utrinque tenuiter pubescentia; petioli 2–4 mm. longi. *Inflorescentia* trichotomo-corymbosa, ramulis pedicellisque pubescentibus. *Pedicelli* 2–4 mm. longi. *Capitula* 5 mm. diam., 15–25-flora, pedicellata. *Involucri* campanulati bracteae glabrae, minute ciliolatae, apice purpurascentes, floribus duplo breviores; interiores 3–3·5 mm. longae, 1–1·5 mm. latae, oblongae, obtusae vel subacutae; exteriores gradatim breviores, ellipticae vel suborbiculares, acutae. *Corolla* 5-fida, purpurea; tubus 2·5–3·5 mm. longus, sparse glanduloso-pubescens; lobi 2–2·5 mm. longi, lineares, acuti, glabri, stylo subaequantes vel paullo breviores. *Achaenia* 1·5 mm. longa, obovoidea, leviter curvata, 5-sulcata, glabra. *Pappi* setae 1–1·5 mm. longae, caducae, scabrae.

RHODESIA. Manika District; Inyanga Mountains, 1800–2100 mm., *E. Cecil*, 227A.

838. **Vernonia bothrioclinoides**, *C. H. Wright* [Compositae-Vernoniaceae]; ex affinitate *V. karaguensis*, Oliv. et Hiern, recedit bracteis longioribus recurvis, achaeniis tricostatis et pappo uniseriato.

Caulis suffrutescens, leviter costatus, pubescens. *Folia* oblongo-lanceolata, acuta, 6 cm. longa, 1–2 cm. lata, supra scabra vel scaberula, subtus tomentosa, marginibus plus minusve crenulatis. *Capitula* 6–8 mm. diam., plurima, corymbosim disposita. *Bracteae* oblongae, acuminatae, recurvae, longiores 6 mm. longae, 1 mm. latae, exteriores sensim minores, apice purpureo-tinctae, extus pilosae. *Corolla* purpurea, 4 mm. longa, extus pubescens, lobis oblongis. *Achaenia* plano-convexa, tricostata, inter costas pubescentia. *Pappus* uniserialis, corollæ æquilongus, scaber.

BRITISH CENTRAL AFRICA. Nyasaland; Namasi, *Cameron*, 40; Mount Chiradzulu, *Whyte*.

839. **Vernonia mashonica**, *N. E. Brown* [Compositae-Vernoniaceae]; species distinctissima ex affinitate *V. senegalensis*, Less.

Frutex ramosus, ad 1 m. usque altus. *Rami* angulati, glabri vel subpruinosi. *Folia* alterna, 1·5–2·5 cm. longa, 2–10 mm. lata, oblanceolata vel spathulato-oblanceolato, obtusa vel subacuta, integra vel 1–2-dentata, coriacea, utrinque glabra, glanduloso-punctata, reticulato-venosa. *Cymae* plures, sublaxae, corymbosae. *Capitula* pedicellata, 5-flora, circa 1 cm. longa, 6 mm. diam., alba. *Involucri* campanulati bracteae quam flores duplo breviores, oblongae vel elliptico-oblongae, obtusae, brevissime mucronatae, pubescentes, stramineae, apice viridi-notatae. *Corolla* 5-dentata, glandulosa; tubus 5 mm. longus, angustissime infundibularis; dentes 2 mm. longi, lineari-attenuati. *Ovarium* dense glandulosum; stigmata filiformia, hirtella. *Pappi* setae corollo subaequantes, niveae, scabrellae.

RHODESIA. Mashonaland; common at Salisbury, *Hon. Mrs. Evelyn Cecil*, 70; at Umtali, *E. Cecil*, 229.

840. **Pteronia sordida**, *N. E. Brown* [Compositae-Asteroideae]; affinis *P. glomeratae*, Linn. f., sed capitulis brevioribus, squamis involucri angustioribus et cortice cinereo differt.

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Frutex nanus, ramosus, cortice cinereo. *Folia* opposita, fasciculata, 1–5 mm. longa, 0·5–1 mm. lata, lineari-trigona vel subteretia. *Capitula* terminalia, solitaria, 1–1·5 cm. longa, 6–8 mm. diam., 5–9 flora. *Involucri* squamae subquinqueseriatae, interiores 1 cm. longae, 2–2·5 mm. latae, lineari-oblongae, obtusae, exteriores gradatim minores, apice dorso gibboso-dentatae, virides, membranaceo-marginatae, subnitidae. *Corolla* 8 mm. longa, tubulosa, basi contracta, apice 5-dentata, glabra; dentes 2 mm. longae, lineari-oblongae, acutae. *Ovarium* pilis longis albis appressis dense vestitum. *Pappi* setae numerosissimae, lutescentes, exteriores breviores.

CAPE COLONY. Middelburg Division, 1100 m., *Gilfillan in Herb. Galpin*, 5527.

XIX.—PERSIAN GUM.

(*Amygdalus leiocarpa*, Boiss.)

From time to time consignments of gum of dissimilar character appear in the commerce of this country as Gum Arabic, not the least interesting being the subject of this note. Little appears to have been written regarding this product however, but the following details gathered from the *Pharmaceutical Journal*, March 29th, 1890, p. 793, may be quoted, not only as throwing light upon the subject, but also as an illustration of the difficulty frequently experienced in determining the geographical as well as the botanical sources of a trade product. Quoting as his authority Professor E. Sickenberger, the writer of the note referred to says that it appears that quantities of this gum "are sent from Bushire, either "to a small port on the west coast of the Red Sea or to Jedda, in "order that it may be substituted for Kordofan gum. It is thence "conveyed to Assouan and packed in old Kordofan packages and "sold as genuine gum. Owing to its pale colour and the absence "of any suspicion that the gum from Assouan could be other than "good Gum Arabic, a considerable amount has been sold. The gum, "however, is described as not soluble in water, but only swelling "up in it, and as being less brittle than Kordofan gum. Professor "Sickenberger suggests that this Persian gum may be the produce "of *Prunus bokhariensis*, Royle, and *Prunus Puddum*, Roxb. "The specimens of Persian gum that have appeared in the London "market resemble East Indian or Senegal gum of good colour "rather than the white minutely cracked Kordofan gum."

With regard to the suggestion that this gum may possibly be derived from *P. bokhariensis* and *P. Puddum*, it may be well to state here that the Herbarium contains no specimens of the first mentioned species, and as far as can be ascertained there is no published description of it. In Hooker's *Flora of British India*, Vol. II., p. 315, it is placed under *P. communis*, Huds., var. *insititia*, with the following note:—"I have seen no specimens "of Royle's *P. aloocha* and *bokhariensis*, but have no reason to "doubt that they are referable to this."

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In response to an application made to the India Office, samples of the gums of *P. Puddum* and *P. communis* were collected in the Punjab and forwarded to Kew in July, 1890. These bear little resemblance to the Persian gum, though they agree with it in being insoluble in water.

The Museum contains three samples of Persian gum, all apparently identical. The oldest sample was received as "Wild Almond Gum" so long ago as August, 1854. Another sample formed part of 25 bags of "Persian Gum Arabic" imported from Bagdad and included in the London Drug Sales of June 9th, 1893. The third sample was collected by Dr. O. Stapf in 1885, who says of it:—"I may add that I saw a kind of cerasin (gummi nostras) "being sold in the bazaars at Shiraz for medicinal purposes. It "was called Ketirah-ı-Arjen and stated to be derived from the "Arjen shrub (*Amygdalus leiocarpa*, Boiss.). Later I myself "collected it from this species on Kuk Chah Sia, north of Shiraz, "where it was plentiful on the ground underneath a few shrubs "and also on the stems. A sample of it is in the Museum. It "looks externally very like Gum Arabic. The same kind of gum "is also sold at Kirman under the name of 'Djäbd ı Ardjän,' "whilst it is replaced by the gum of a plum ('Samgh-ı-âlutschäh') "and of a cherry ('Samgh ı gîlâs') in Ispahan." (*See* Andreas und Stolze in Peterm. Geogr. Mitth. Erganz., B. XVII., II., p. 15.)

From the notes and material obtained by Dr. Stapf it is evident that some if not the greater part of the Persian Gum of commerce is derived from *Amygdalus leiocarpa*, Boiss.

In the Diplomatic and Consular Report on the trade of Bushire for the year 1905 it appears that there is an increasing export of gum from that port, as the following figures show:—

——	1903.	1904.	1905.	Increase.
	Value.	Value.	Value.	
Gum	£38,046	£64,869	£70,949	£6,080

J. M. H.

XX.—PERPETUATION OF "POTATO DISEASE" AND POTATO "LEAF-CURL" BY MEANS OF HYBERNATING MYCELIUM.

The sudden and simultaneous appearance of "Potato-disease," caused by *Phytophthora infestans*, De Bary, over widely extended areas in Britain and other countries has hitherto been attributed to the rapid production and diffusion of spores during a period when special meteorological conditions favoured the rapid development of the fungus.

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This explanation, however, when carefully considered, proves to be altogether inadequate. When a potato plant infected with the spores of *Phytophthora* is placed under a bell-jar in a very damp atmosphere, subdued light, and high temperature—conditions most favourable to the development of the parasite—it is only after a period of four or five days that the fungus produces fruit on the leaves, and then only at the points of infection. On the other hand the fact is too well known that a field of potatoes or all the potato fields in a certain district which at a given moment appeared perfectly healthy and vigorous, have, under certain climatic conditions, been reduced to a blackened, decaying, foetid condition within 24 hours. Again, in the case of every fungus epidemic proved to be due to the diffusion of spores, the disease always originates from one or more primary centres of infection, and gradually extends, whereas in the case of potato disease the appearance of the epidemic is often simultaneous over a considerable area.

These considerations suggested the existence of some method other than dissemination by means of spores as the cause of such sudden outbreaks of disease. The presence of mycelium can readily be demonstrated in the tissues of diseased potato tubers, and a series of experiments conducted at Kew have conclusively proved that such hybernating mycelium in a tuber is capable, under favourable conditions, of perpetuating the disease.

Three diseased potato tubers showing rusty stains characteristic of the presence of *Phytophthora* mycelium in the flesh were each cut into two equal parts. Each half tuber was planted separately in a plant pot; the same kind of soil and manure, sterilized by steam, was used in all the experiments. Three of the pots were placed in a house having a temperature ranging between 70° and 80° Fahr., in dull light, and with the moisture often at saturation point. Each pot was placed under a bell jar. The three remaining pots were placed in a well-lighted house, without any artificial heat, and with an exceptionally dry atmosphere. These pots were not placed under bell-jars. An equal amount of water was supplied to each of the six pots. The three plants grown under conditions of high temperature, dull light, and much moisture in the air, showed the first indication of *Phytophthora* when the shoots were six weeks old, and a fortnight later the three plants were blackened and destroyed by the fungus.

The three plants grown in the cool, well-lighted, dry house showed no trace of disease at the end of two months, when one of the plants was removed to the warm house and placed under a bell-jar. Within nine days this plant was blackened and killed by the fungus. A fortnight later a second plant was removed from the cool to the warm house and placed under a bell-jar. Within a week of the removal of this plant it was also covered with *Phytophthora*. The third plant continued growing in the cool house for 13 week, and remained perfectly free from *obvious* disease.

Similarly marked results were obtained by using potato tubers produced by a plant that was badly infested with potato "leaf-curl"

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(*Macrosporium solani*, Cooke), proving that this disease can also be perpetuated by hybernating mycelium present in the tubers.

The above experiments, in addition to proving that the diseases indicated can be transmitted from one generation to another by means of mycelium present in the tubers, also demonstrate another point of much practical importance, namely, that the absence of *obvious* disease in a crop does not necessarily prove the absence of such disease in a *latent* form.

In the experiments described above, it was known at the commencement that the six half-tubers were all diseased. The three plants grown in the hot, damp, badly-lighted house were promptly destroyed, simply because the conditions indicated were detrimental to the growth of the potato but highly favourable to the rapid development of the fungus, which soon became dominant and destroyed its host-plant. On the other hand, the three potato plants in the cool house grew normally under the lower temperature, less atmospheric moisture and better light, a set of conditions very detrimental to fungus growth; hence, although the parasite was present, it remained entirely in abeyance, and the practical man would, without hesitation, have pronounced the plants free from disease.

Every potato grower of experience can predict almost with certainty the moment when potato disease will appear; the necessary conditions are warm, damp, dull weather, but instead of the sudden outbreak being due to the rapid diffusion of spores, as has hitherto been believed, it is far more probable that in the majority of instances it is due to the existence of mycelium, already present in the tissues, which had hitherto been prevented from manifesting itself in an aggressive form owing to the absence of favourable climatic conditions.

GEORGE MASSEE.

XXI.—NEW ORCHIDS. DECADE 28.

271. **Masdevallia peruviana**, *Rolfe*; affinis *M. auropurpureo*, Reichb. f., sepalorum tubo lato nec constricto, caudis brevioribus, labello medio carinato, et colore florum distincta.

Folia oblongo-lanceolata, subobtusa, 6–8 cm. longa, 1·5–1·8 cm lata, basi in petiolum 2·5–4 cm. longum attenuata. *Scapi* subteretes, 6–8 cm. longi, 1–2-flori. *Bracteae* conduplicatae, late oblongae, apiculatae v. obtusae, 8–10 mm. longae. *Pedicelli* 1–1·2 cm. longi. *Sepalorum* tubum late cupulatum, 6–8 mm. longum; lobus posticus triangularis, parvus, cauda tenui, recurva 1·3–1·5 cm. longa; lobi laterales latissime ovati, ad medium connati, caudis tenuibus, recurvis 7–9 mm. longis. *Petala* lineari-oblonga, apice bidentata, 5–6 mm. longa. *Labellum* subpandurato-oblongum,

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apice valide recurvum, apiculatum, 6 mm. longum, carinis 2 obliquis ad medium instructis dein attenuatis et prope apicem obsoletis. *Columna* clavata, 6 mm. longa, marginibus alatis.

PERU. Collector unknown.

Flowered in the Royal Botanic Gardens, Glasnevin, in July, 1898, and on several subsequent occasions. The tube of the sepals is light brown, the apex of the lateral sepals red-purple, fading away to whitish near the base, and the petals and lip white tinged with lilac.

272. **Dendrobium (Stachyobium) compactum**, *Rolfe;* affine *D. alpestri*, Royle, sed racemis brevioribus et densioribus, bracteis latioribus, et labello minute crenulato, nec inciso-serrato, facile distinguendum.

Herba epiphytica, caespitosa, 4–5 cm. alta. *Pseudobulbi* fusiformes, 3–4 phylli. *Folia* oblonga, inaequaliter biloba, obtusa, 1·5–2 cm. longa, 3–5 mm. lata; basi vaginata, vaginis striatis. *Racemi* terminales v. subterminales, 1·3–2 cm. longi, 5–6-flori. *Bracteae* ovato-lanceolatae, acutae, 2–3 mm. longae. *Pedicelli* graciles, 4 mm. longi. *Sepalum* posticum oblongo-lanceolatum, acutum vel acuminatum, 4 mm. longum; sepala lateralia obliqua, triangularia, acuta, 4 mm. longa, basi 4 mm. lata. *Petala* oblongo-lanceolata, acuta v. acuminata, 4 mm. longa. *Labellum* subtrilobum, recurvum, 5 mm. longum; lobus intermedius ovatus, apiculatus, undulatus et minute crenulatus; lobi laterales oblongi, obtusi, margine minute crenulati; discus obtuse bicarinatus. *Columna* lata, 1·5 mm. longa. *Mentum* conicum, obtusum, incurvum, 5 mm. longum.

YUNNAN. Szemao; Western Forests and Tea Hills, 1500 m., *A. Henry*, 11752 A, 12752.

Flowered in the collection of Madame Louis de Hemptinne, of Ghent, in December, 1903. The flowers are white, with the lip light green.

273. **Dendrobium (§ Clavipes) annamense**, *Rolfe;* affine *D. crumenato*, Swartz, floribus minoribus flavescentibus, labello integro facile distinguendum.

Herba epiphytica. *Caules* patentes vel subpenduli, graciles, circa 4–5 dm. longi, prope basin dilatati et subcompressi. *Folia* oblonga, obtusa, subcoriacea, 5–7 cm. longa, 1·5–2 cm. lata. *Flores* axillares, ad nodos laterales defoliatos fasciculati vel breviter racemosi, saepissime triflori. *Bracteae* ovatae, acutae, submembranaceae, 2-3 mm. longae. *Pedicelli* graciles, 1·3–1·5 cm. longi. *Sepalum* posticum ovato-triangulare, acutum, circa 1 cm. longum; sepala lateralia triangularia, acuta, basi ad columnae pedem in mentum curvatum obtusum circa 1·3 cm. longum extensa. *Petala* lanceolato oblonga, subacuta, circa 1 cm. longa. *Labellum* late oblongum, obtusum, apice leviter crenulatum, basi subattenuatum, circa 1·5 cm. longum; discus laevis. *Columna* latissima, circa 2 mm. longa.

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ANNAM. *Micholitz.*

Introduced by Messrs. Sander and Sons, and flowered in their establishment in March, 1906. The flowers are buff-yellow and rather membranous.

274. **Bulbophyllum calabaricum,** *Rolfe ;* affine *B. recurvo,* Lindl., sed labello facie papilloso et marginibus ciliatis facile distinguendum.

Rhizoma repens. *Pseudobulbi* approximati, ovoideo-tetragoni, 1·3–2 cm. longi, monophylli. *Folia* oblonga vel lanceolato-oblonga, subobtusa v. apiculata, coriacea, 4–7 mm. longa, 1·3–2 cm. lata. *Scapi* suberecti vel arcuati, 7–13 cm. longi, multiflori. *Bracteae* lanceolato-oblongae, acutae, 3–4 mm. longae. *Pedicelli* 2 mm. longi. *Sepala* triangulari-lanceolata, acuta vel subacuminata, 5–6 mm. longa. *Petala* oblonga, apiculata, minutissime papillosa, 2 mm. longa. *Labellum* oblongum, subobtusum, carnosum, papillosum et ciliatum, recurvum, 1·5 mm. longum. *Columna* latissima ; dentes subulati, acuti, vix 1 mm. longi.

W. TROP. AFRICA. Old Calabar, *Holland.*

Sent to Kew by Mr. J. H. Holland, Botanic Garden, Old Calabar ; and flowered in the collection in October, 1899. The flowers are light yellowish green, with a dull reddish purple lip.

275. **Polystachya bicolor,** *Rolfe ;* a *P. purpurea,* Wight, pedicellis longioribus labelli lobis lateralibus supra medium affixis, a *P. rosea,* Ridl., floribus multo minoribus differt.

Caules caespitosi, 2·5–5 cm. longi, 3–4-phylli, basi crassiusculi. *Folia* lanceolato-oblonga, subobtusa vel inaequaliter bidentata, 4–9 cm. longa, 1–1·7 cm. lata. *Scapi* 7·5–10 cm. longi, vaginis paucis obtecti ; panicula laxa, 2·5–5 cm. longa, multiflora, rachi pubescente. *Bracteae* basi latae, apice acuminatae, 1–1·5 mm. longae. *Pedicelli* 4–6 mm. longi. *Sepalum* posticum ovatum, acutum, 3 mm. longum ; sepala lateralia obliqua, late triangularia, apiculata, 3 mm. lata. *Petala* obovato-oblonga, apiculata, 3 mm. longa. *Labellum* 4 mm. longum, late unguiculatum, supra medium trilobum ; lobi laterales oblongi, obtusi, 1 mm. longi ; lobus intermedius suborbicularis, obtusissimus vel minutissime bidentatus, 2 mm. latus ; discus omnino farinaceo-pubescens ; callus oblongus, depressus, obtusus. *Columna* lata, 1·5 mm. longa. *Mentum* late oblongum, obtusum, fere 3 mm. longum.

SEYCHELLES. Cascade Estate ; on rocks in mountains, common, *Thomasset,* 58.

A living plant was also sent to Kew, where it flowered in September, 1903. The pedicels and sepals are light purple, while the petals, lip and column are cream white. It is very distinct from the two other Seychelles species.

276. **Saccolabium rubescens,** *Rolfe ;* a *S. ampullaceo,* Lindl., caule altiore, foliis latioribus et subrecurvis, racemis pedunculatis, sepalis petalisque multo minoribus differt.

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Caulis erectus, robustus, circa 2·5 dm. altus. *Folia* patentia vel recurva, coriacea, oblonga, inaequaliter et brevissime biloba, 1·2–1·5 dm. longa, 2·5–3·2 cm. lata. *Scapi* suberecti, 1·5–1·7 cm. longi. *Racemi* 7·5–10 cm. longi, multiflori. *Bracteae* ovatae, obtusae, concavae, 1 mm. longae. *Pedicelli* 1·8–2 cm. longi. *Sepalum* posticum late ellipticum, obtusum, vix 4 mm. longum; sepala lateralia ovata, quam posticum latiora. *Petala* late elliptica, obtusa, vix 4 mm. longa. *Labellum* trilobum; lobi laterales transverse oblongi, obtusissimi, incurvi, breves; lobus intermedius ovato-oblongus, subacutus, basi patens, apice incurvus, 1 mm. longus; calcar strictum vel subincurvum, 1 cm. longum. *Columna* brevissima.

ANNAM. *Micholitz.*

Imported by Messrs. Sander and Sons, in 1903, and flowered at Kew in March, 1906, and shortly afterwards at Glasnevin. The flowers are uniformly light rose-purple in colour.

277. **Sarcanthus inflatus**, *Rolfe;* a speciebus reliquis labelli calcare inflato segmentis multo longiore differt.

Folia anguste oblonga, crasse coriacea, apice inaequaliter et obtuse biloba, 6–12 cm. longa, 1–1·5 cm. lata. *Panicula* 9–12 cm. longa, multiflora. *Bracteae* late ovatae, subacutae, 1–2 mm. longae. *Pedicelli* 7–8 mm. longi. *Sepala* late oblonga, obtusa, 3 mm. longa. *Petala* oblonga, obtusa, 3 mm. longa. *Labellum* carnosum, trilobum; lobi laterales triangulares, subacuti, 1·5 mm. longi, apice incurvi; lobus intermedius triangularis, subobtusus, 1·5 mm. longus; calcar inflatum, ellipsoideo-oblongum, obtusum, lateribus subcompressum, 5 mm. longum. *Columna* latissima, 1·5 mm. longa; pollinarii glandula hippocrepiformis.

ANNAM. *Micholitz.*

Introduced by Messrs. Sander and Sons, and flowered in the Royal Botanic Gardens, Glasnevin, in April, 1906. It belongs to the group with bilobed leaves and paniculate inflorescence, but owing to the disproportion between the spur and the rest of the flower, cannot well be compared with any other species. The sepals and petals are green, with a pair of dark brown stripes, the front lobe of the lip light yellow, and the side lobes white, with a purple stain on the side next the column, which extends down the underside of the lip, terminating in a pair of radiating veins.

278. **Listrostachys fimbriata**, *Rolfe;* species *L. fragrantissimae*, Reichb. f., simillima, sed labelli calcare longiore et tenuiore facile distinguenda.

Folia pendula, anguste oblonga, inaequaliter biloba, obtusa, basi paullo attenuata, coriacea, circa 3–3·2 dm. longa, 4·5–5 cm. lata. *Racemi* penduli, circa 3 dm. longi, multiflori. *Flores* oppositi. *Bracteae* connatae, tubulosae, 2 mm. longae, apice apiculatae vel fere truncatae. *Pedicelli* 5 mm. longi. *Sepala* ovato-lanceolata, acuminata, 1–1·5 cm. longa. *Petala* similia sed minora, margine erosa vel subfimbriata. *Labellum* late panduratum, 1–1·3 mm.

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longum, 7–8 mm. latum, apice trilobum; lobus intermedius longe acuminatus; lobi laterales subdolabriformes, fimbriati; calcar pendulum, basi gracile, dein subito unilateraliter inflatum, apice attenuatum, subobtusum vel apiculatum, 1–1·3 mm. longum, circa 2 mm. latum. *Columna* latissima, 2 mm. longa.

E. TROP. AFRICA. Uganda, Entebbe; "not very common," *Mahon*, 5.

Dried and living specimens were sent to Kew by the late Mr. John Mahon, Curator of the Uganda Botanic Station. It has since flowered in the collection. The flowers are translucent white, with a slight greenish tinge. The collector describes it as very floriferous.

279. **Mystacidium Mahoni**, *Rolfe;* affine *M. xanthopollinio*, Reichb. f., sed labelli calcare valde incurvo limbum parum excedente facile distinguendum.

Caulis elongatus, scandens, 4 mm. diam.; internodia, 1·3–2 cm. longa, radicantia. *Folia* linearia, apice breviter et inaequaliter biloba, 7·5–11 cm. longa, 6–9 cm. lata, subcoriacea. *Racemi* graciles, 7·5–10 cm. longi, subflexuosi, multiflori. *Bracteae* latae, tubulosae, subtruncatae, 2 mm. longae. *Pedicelli* 2–2·5 mm. longi. *Sepala* elliptico-oblonga, obtusa, fere 3 mm. longa. *Petala* orbiculari-ovata, obtusa, fere 3 mm. longa. *Labellum* late obovato-flabellatum, obscure trilobum, minute crenulatum, 3 mm. longum, 4 mm. latum; calcar lineari-oblongum, obtusum, incurvum, circa 4 mm. longum. *Columna* lata, 1 mm. longa; rostellum triangulare, acutum, 1 mm. longum.

E. TROP. AFRICA. Uganda; Entebbe, "grows in large interwoven masses," *Mahon*, 7.

Described from dried specimens sent with the preceding.

280. **Vanilla zanzibarica**, *Rolfe;* a *V. africana*, Lindl., foliis elliptico-oblongis apice latis, a *V. crenulata*, Rolfe, labello majore marginibus ad columnam supra medium adnatis differt.

Caules subgraciles, scandentes; internodia 5–9 cm. longa. *Folia* elliptico-oblonga, breviter acuminata et subobtusa, 7–11 cm. longa, 3–5 mm. lata, coriacea, venis prominentibus. *Racemi* axillares, simplices, circa 2·5–3 mm. longi, multiflori. *Bracteae* ovatae, subobtusae, patentes, 2 mm. longae. *Sepala* elliptico-oblonga, subobtusa, 2–2·5 cm. longa, 10 mm. lata. *Petala* oblonga, subobtusa, 2–2·5 mm. longa, 8 mm. lata. *Labellum* profunde trilobum; lobi laterales truncati, 1–1·3 cm. longi, apice denticulati, marginibus columnae adnatis tubum latum subsaccatum formantibus; lobus intermedius late triangulari-ovatus, subobtusus, 1 cm. longus, 9 mm. latus, subconcavus; crista retrorsa, e foliolis ramentaceis fimbriatis imbricatis composita, linea mediana paullo incrassata supra cristam obscure 3-carinata, infra cristam obscure 5-carinata. *Columna* incurva, 1·6–2 cm. longa. *Capsulae* lineares, graciles, 1–1·5 mm. longae, inodoratae. *Vanilla sp.* [R. N. Lyne in], "*The Shemba*," Aug., 1898, 1; Nov. and Dec., 1898, 2.

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E. TROP. AFRICA. Zanzibar; on the Wanda, near Dunga, *Lyne.*

Interesting as the first East African species of the section *Foliosae*, of which seven species are known from West Africa. It is said to be weak and straggling, and to climb upon the dense scrub. The flowers are described as purplish at the base, but losing their colour as they open, the lip being striped with purple and stiffened by a convex rib which bears a reflexed tuft of creamy yellow hairs one-third of the way down. The fruit is spirally twisted. Dried specimens were sent to Kew by Mr. R. N. Lyne, Director of Agriculture, Zanzibar.

XXII.—CHINESE WOOD OIL.

(*Aleurites Fordii*, Hemsl., and other species of *Aleurites*.)

Chinese Wood Oil has long been known to specialists in this country as one of the most important vegetable products of China. Hitherto it has been accepted without question that *Aleurites cordata*, R. Br., was the species from which this oil was obtained. Recent investigations by Mr. W. B. Hemsley, in the course of a revision by him of the genus *Aleurites*, has led him to conclude that the T'ung Yu of the Chinese—the source of the true Chinese wood oil—is not *A. cordata*, but a very distinct species, *A. Fordii*, Hemsl. It is, however, certain that *A. cordata*, R. Br., affords a similar product. The resumé of his results, supplied by Mr. Hemsley, which is given at the end of this note, will show how intricate the confusion between the various species of *Aleurites* has been. This confusion has been partly the result and partly the cause of a confusion that has prevailed with regard to their economic properties.

In an interesting article on this subject in the *Chemist and Druggist*, May 31st, 1902, which is quoted freely in this note, Dr. A. Henry states that he has met with the T'ung Yu tree wild in the mountainous parts of Hupeh in Central China at elevations of from 500 to 5,000 feet, where it attains a height of about 40 feet. It is largely planted in the mountainous districts in the provinces of Hupeh, Szechwan, Hunan, Chekiang, and Fukien. In Central China it succeeds best in rocky barren spots where there is a thin soil and where farming is impossible, cultivated trees rarely exceeding 20 feet in height. A small tree is said to yield from 100 to 200 lbs. of fruits, each containing three or four large seeds, and little labour is required either in planting the trees or in collecting the fruits. The climate in those parts of China where the tree is most cultivated is an extreme one. The summer is hot, the temperature rising to 100° F. in July and August. The winter is cold, snow often lying on the ground for days, but severe frosts are unknown. The tree is also planted much further south, and will succeed in tropical regions. It soon comes into bearing, the fruits ripening in the autumn; it would

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therefore seem to be very suitable for planting in certain of our possessions, such as Ceylon and the Nilgiris, in Natal, and perhaps in the mountainous parts of the West Indies. It might be tried in barren mountainous regions where farming or ordinary planting would be impossible.

Two varieties of oil are obtained from the seeds, distinguished as white t'ung oil, which is cold drawn and is a yellow, transparent, moderately thick oil used in Central China for varnishing furniture and umbrellas, for lighting purposes, and for making oiled paper. The other form is known as black t'ung oil, which is extracted by heat and pressure, and is a thick, blackish, opaque liquid which is cheaper in price than the other kind, and is used for coarser work, as in making putty used in caulking boats, for painting boats, &c.; the latter variety does not appear to be exported.

Wood oil is stated to be the best drying oil known, and to be superior in this respect to linseed oil. The chief use to which it is put in China is for preserving woodwork, to which it imparts a clear glossy appearance. Chinese junkmen use no paint in the upkeep of their vessels—only this oil, which answers the purpose admirably, the boats having a marvellously clean appearance and glistening in the sun like mirrors.

Within the past ten years t'ung oil has been exported in increasing quantities to European and American ports, the Americans being the first to appreciate the qualities of the oil. It is shipped in 4- to 5-cwt. casks, and there is often considerable loss from leakage—sometimes as much as 35 per cent.; therefore efforts are being made to induce the Chinese to employ casks of smaller capacity.

The oil is frequently adulterated with, it is believed, bean oil extracted from the seeds of *Glycine hispida*, Maxim., which seriously affects its drying properties. Smaller quantities of the oil are shipped from Canton, this being considered of superior quality to that exported from Hankow.

Large quantities of oil are also exported from Wenchow to Hong Kong, thence to Singapore for distribution.

In connection with this industry it appears that there is great difficulty in obtaining barrels at Hankow, consequently an American firm exports shooks from New York and has erected machinery on the spot for setting them up.

With regard to the uses of t'ung oil in Europe and America, it is known that it is employed to a considerable extent in one or two industries and is also being experimented with in others, but much secrecy is maintained regarding the matter. So far as can be gathered, it is employed in linoleum factories, as a substitute for linseed in some industries, and is also believed to form the basis of a varnish to compete with that produced from copal.

It may be noted that this oil has poisonous properties; the refuse cake is employed as manure in China.

Messrs. Dalton & Young, of Fenchurch Street, have courteously permitted the publication of the following table supplied by them,

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which gives particulars of the shipments of Hankow wood oil during the year 1905 :—

—	Hamburg.	Marseilles.	Antwerp.	Trieste.	London.	Rotterdam.	America.	Havre.	Liverpool.	Leghorn.	Dunkirk.
	Pcls.	Pcls.	Pcls.	Pcls.	Pcls.	Pcls.	Pcls.	Pcls.	Pcls.	Pcls.	Pcls.
January	170	181	459	—	288	—	5,219	82	—	—	—
February ..	—	—	—	—	83	—	1,511	—	—	—	—
March	—	—	—	—	86	—	—	127	—	—	—
April	—	—	—	—	—	—	1,022	—	—	—	—
May	348	—	171	—	88	—	6,412	167	—	—	—
June	569	345	169	101	—	84	6,163	—	—	—	—
July	1,963	—	2,861	—	—	—	7,432	441	—	88	—
August	2,810	—	1,761	—	1,085	—	4,009	94	—	—	36
September ..	3,594	—	2,825	—	2,211	278	1,540	—	—	—	—
October	1,013	—	1,162	168	1,772	83	3,073	—	—	—	—
November ..	1,521	—	1,182	—	1,096	174	9,785	—	—	—	—
December ..	606	—	168	—	1,963	253	3,368	—	420	—	—
	12,595	526	10,749	269	8,521	872	49,514	911	420	88	36

Total, 84,501 piculs for 1906 against 84,249 piculs, 1904.
" " " 99,447 " 1903.
" " " 102,021 " 1902.
" " " 23,636 " 1901.

Under the name of Balucanat or Balucanag a sample of an oil seed from the Philippines imported into Liverpool was received at the Museum in 1891. Subsequently, in 1897, what appears to be the same thing came into the London market, said to have been shipped from Hong Kong. These are both believed to be derived from *Aleurites trisperma*, Blanco, a native of the Philippines.

J. M. H.

Revision of the Synonymy of the Species of Aleurites.

Much confusion prevails in botanical literature as regards the application of the names of the species of *Aleurites*. This is largely due to the fact that the common Chinese species, the T'ung Yu or Wood Oil Tree, has hitherto been erroneously regarded as identical with the species, *Aleurites cordata*, R. Br., originally described by Thunberg as *Dryandra cordata*. Another source of error, but of a different kind, has been the assumption, especially by earlier writers, that *Dryandra cordata*, Thunb., and *Vernicia montana*, Lour., which are in reality identical, were

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different trees. The results of a careful study of the material available and of the literature of the subject are here briefly summarised.

1. **Aleurites cordata**, R. Br. ex Steud. Nomencl. Bot., ed. 2, vol. i. (1840), p. 49; Muell. Arg. in DC. Prodr. vol. xv., 2 (1866), p. 724.

Dryandra cordata, Thunb. Fl. Jap. (1784), p. 267, t. 27.

Dryandra oleifera, Lam. Encycl., vol. ii. (1786), p. 329, non Wall. Cat.

Elaeococca cordata, Blume, Bijdr. (1825), p. 618.

Vernicia montana, Lour. Fl. Cochinch, ed. 1, vol. ii. (1790), p. 587.

Dryandra Vernicia, Correa in Ann. Mus. Par., vol. viii. (1806), p. 69, t. 32.

Aleurites Vernicia, Hassk. in Flora Jahrg. 15, vol. ii. (1842), Beibl. 2, p. 40.

Aleurites japonica, Blume ex Miq. in Ann. Mus. Bot. Lugd.-Bat., vol. iv. (1868), p. 120.

Aleurites verniciflua, Baill. Hist. Pl., vol. v. (1874), p. 116.

Elaeococcus Vernicia, Adr. Juss. ex Spreng. Syst. Veg., vol. iii. (1826), p. 884.

Elaeococca verrucosa, Adr. Juss. Euphorb. Gen. Tent (1824), p. 38, t. 11, f. 35, quoad flores tantum.

There are specimens of this in the Kew Herbarium from Japan, Formosa, Hainan, and Tongking, and cultivated specimens from Hong Kong raised from seed obtained from Cochin-china; but none from the mainland of China. Shirasawa, the most recent Japanese authority (Iconographie des Essences Forestières du Japon, vol. i., p. 93), treats this as a cultivated tree in Japan.

It is possible that some of the writers cited above, especially those dealing with cultivated specimens, had not the true *A. cordata* under observation. Indeed, it is probable that they had not, because the one cultivated in India in Wallich's time was not that species.

A. cordata, as compared with *A. Fordii*, with which it has been confused, has relatively narrow petals, deeply divided styles, and a wrinkled fruit, as figured by Correa. The leaves, too, are thinner in texture, and commonly lobed in the flowering branches.

2. **Aleurites Fordii**, *Hemsl.* in Hook. Ic. Pl. tt. 2801 et 2802, ined.

Aleurites cordata Muell. Arg. in DC. Prodr. vol. xv., 2, p. 724, pro maxima parte; Hemsl. in Journ. Linn. Soc., vol. xxvi., p. 433, præter *Elaeococcam verrucosam* partim, syn. omn. excl., et auctorum aliorum multorum, saltem pro parte.

Elaeococca verrucosa, Adr. Juss. Euphorb. Gener. Tent. t. 11, quoad fructum et semen.

Dryandra oleifera, Wall. Cat. n. 7958; Hook. f. Fl. Brit. Ind., vol. v., 1, p. 384; non Lam.

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There are specimens of this at Kew, from the Chinese Provinces of Chekiang, Kiangsi, Fokien, Hupeh, and Yunnan, and cultivated specimens from Hongkong and India.

In *A. Fordii*, the flowers are developed before the entire leaves; the petals are broad and rounded; the styles are very shortly bifid, and the apiculate capsule is not wrinkled.

3. **Aleurites triloba**, Forst. Char. Gen. (1776), p. 112, cum ic., et Prod. Fl. Ins. Austral., p. 68.

Aleurites moluccana, Willd. Sp. Pl., vol. iv. (1805), p. 590; Muell. Arg. in DC. Prodr., vol. xv., 2, p. 723.

Aleurites commutata, Geisel. Crot. Monogr., p. 82.

Aleurites Ambinux, Pers. Syn., vol. ii., p. 579.

Aleurites cordifolia, Steud. Nomencl. Bot., ed. 2, vol. i., p. 49, non *Dryandra cordata*, Thunb.

Aleurites lobata, Blanco, Fl. Filip., ed. 1, p. 756.

Aleurites lancifolia, Blanco, op. cit., p. 757.

Camirium cordifolium, Gærtn. Fruct., vol. ii., p. 195, t. 125, f. 2.

Camirium oleosum, Reinw. ex Blume, Cat. Gew. Buitenz., p. 104.

Jatropha moluccana, Linn. Sp. Pl., ed. 1 (1753), p. 1006.

Malaya and Polynesia, and naturalised in many other tropical countries.

4. **Aleurites trisperma**, Blanco, Fl. Filip., ed. 1, p. 755.

Aleurites Saponaria, Blanco, Fl. Filip., ed. 2, p. 520; ed. 3, p. 156, t. 296; Nov. App., p. 191.

Philippine Islands.

The seeds of this species are imported under the name of *Balucanag*, and they are so much like those of *A. cordata* as to have been mistaken for them.

W. B. H.

XXIII.—MISCELLANEOUS NOTES.

MR. G. H. PRING, lately a member of the gardening staff of the Royal Botanic Gardens, Kew, has, we learn from the *Journal of Horticulture*, been appointed orchid grower at the Missouri Botanic Gardens, St. Louis, U.S.A.

J. B. LOUIS PIERRE.—This eminent French botanist, who died in Paris, October 30, 1905, deserves some record here, both as a worker at Kew and as a generous donor to the Herbarium and Library. Several lengthy biographical notices of Pierre have appeared, but the following autobiographical note, extracted from

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a letter written to the present Director when he was Superintendent of the Calcutta Botanic Garden, supplies information as to a phase in Pierre's life of which little is known :—

"En effet, après des études incomplètes, après avoir été sucrier "à l'ile Bourbon jusqu' à l'age de 31 ans, des revers de fortune "m'ont conduit dans l'Inde, les ressources de mon pauvre pays "ne m'y promettant aucun avenir. C'est alors que grâce à la "bonté, à la bienveillance toujours soutenue du bien regretté "Docteur Thomas Anderson j'ai été attaché a l'herbier de Calcutta "où j'ai pris goût a la botanique et m'y suis réfugié comme dans "un couvent espèrant échapper aux hasards de la fortune. Les "deux années passeés dans votre herbier m'ont permis d'avoir une "teinture des choses botaniques. Cependant déjà, dans son voyage "à Java le docteur T. Anderson avait traité avec Mr. Kurz et je "dus néscessairement quitter le jardin botanique quand ce re-"gretté botaniste vint prendre à la fin de 1864 les fonctions "d'assistant. J' allai alors en Cochinchine et pendant les 13 ans "que j'y passai, au Jardin Botanique de Saigon, où tout était à "créer, où je dus être à la fois jardinier et botaniste et agriculteur, "contre le gré de l'administration et à mes propres frais, j'ai pu, "sous la necessité d'introduire au jardin les plantes de la région, "exècuter des voyages pendant lesquels j'ai pu réunir l'herbier "du Cambodge et de la Basse Cochinchine."

Pierre's magnum opus is the "Flore forestiere de la Cochinchine," in connection with which he published numerous separate papers embodying the results of subsidiary investigations; but he also published largely on the flora of the French Congo. From 1865 to 1877 he devoted all the time he could spare to collecting in Cochinchina and the adjoining countries. He then returned to Europe and commenced his preliminary studies at Paris, Kew, and elsewhere. Unfortunately, the scale on which the work was planned and the comprehensive extent of the author's investigations outside his own area, rendered completion impossible. It appears that the French Colonial Government have expended a sum exceeding 300,000 francs (£12,000) on this work, of which 25 fasciculi have been issued. The whole consists of 400 large folio plates, crammed full of figures, with detailed descriptive letterpress; it deals with the natural orders from *Magnoliaceae* to *Leguminosae*, arranged nearly as in Bentham and Hooker's "Genera Plantarum." So far as it goes, it is of immense value to students of the Indian and Malayan trees, but it is unfortunate that the figures are so crowded as to be confusing, and the lithography is coarse and unattractive. Pierre has left, we are told, more unpublished work than he published, and all his extensive African as well as Asiatic collections are left to the Paris Museum. He spent much time in the investigation of the anatomy of the petiole, and proposed a classification based upon the presence of one, two, or more woody bundles. Besides copious notes, sketches, and analyses, there are upwards of 10,000 microscopic preparations belonging to his collections, illustrating especially the anatomy of the petiole.

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Alterations near Kew Palace.—The most important alteration made in the grounds during the past planting season was in the precincts of Kew Palace. The old stables have been demolished and the wall surrounding the yard in which they stood has been pulled down also. The space thus occupied is now levelled over and sown with grass seeds, and the boundary fence that separated the Palace grounds from the Gardens proper has been set back to the building itself. These alterations have resulted in the acquisition of a spacious lawn for the use of the public, and they have also brought the Palace more fully into view and made it more accessible. The interesting history of the building and its charming architectural features made these objects very desirable. In order to hide the new boundary fence, and to block out as much as possible any view of Brentford, a new shrubbery was made. To produce an immediate effect, a large number of fine trees and shrubs were brought from other parts of the Gardens—Holm oaks, yews, hollies, &c.—several weighing (with soil attached) from five to seven tons.

Himalayan House.—The north wing or Himalayan division of the Temperate House was built in 1899 for the accommodation of Himalayan, Chinese and Japanese plants. It was furnished with the assistance of Mr. D. H. Shilson, of Tremough, Cornwall, and others, Himalayan rhododendrons being largely used. These were planted in borders of soil procured in the neighbourhood, which, however, did not prove suitable. It was therefore replaced last winter with a mixture of heather-peat and the sandy top-spit of Kew soil, this mixture having proved suitable for rhododendrons in the borders outside at Kew. The operation necessitated the removal of all the plants, some of which proved unfit to be used again ; they were consequently replaced by additional specimen rhododendrons and other plants for which Kew was again indebted to the generosity of Mr. Shilson, and also to Mrs. Coryton, Pentillie Castle, St. Million, Cornwall, and Mr. J. T. Bennett-Poë, Holmwood, Cheshunt.

Umbrella Pine.—The "Umbrella Pine," *Sciadopitys verticillata*, a figure of which is given in the *Botanical Magazine*, t. 8050, prepared from the larger of the two examples in the Kew collection, was scarcely known in gardens until Messrs. J. Veitch & Sons obtained seeds of it from Japan and raised a batch of plants from them in their Coombe Wood Nursery. The two plants above named both came from this nursery, and we have now to thank Messrs. J. Veitch & Sons for a generous gift of 12 more beautiful trees of this most interesting conifer, which had been grown in their nursery for 25 years. They are now planted in a group on the west side of the pagoda vista.

The Kew Salicetum.—The collection of willows at Kew is a very extensive one, probably, indeed, the richest in existence. At one time planted on the piece of ground now occupied by the collection

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of ashes, it was afterwards transferred to the margins of the lake, where, for the most part, it still remains. No place, of course, is so well adapted for the cultivation of willows as one by the side of water. But for so large a number of species, varieties and hybrids as is grown at Kew, more room is needed than the lake affords, without completely shrouding its banks. The picturesque features of the lake at Kew, however, are so delightful and so generally admired that it would be a pity to obscure them in any way. For these reasons it has been decided to found a new Salicetum. It is to occupy a belt of ground in the Queen's Cottage Grounds extending from near the Isleworth Ferry Gate to the Old Deer Park. It borders the Ha-ha near the towing path, but is not yet open to the public. The soil here is moist and fairly good, and there is every reason to believe that willows will thrive. As a commencement, about 200 plants were put out during the spring; these will be added to as occasion offers until the entire botanical collection is transferred.

Trees struck by lightning.—A severe thunderstorm was experienced at Kew on the evening of May 8, during which two trees were struck by lightning; one, a *Robinia Pseudacacia*, standing between the Palace and the Herbarium and about 50 yards from the river; the other, a common elm, one of a group of elms near the Brentford Ferry Gate and about 100 yards from the river. The *Robinia* is 60 feet high with a trunk 2 feet in diameter which is forked 4 feet from the ground, the two main branches rising more or less parallel for about 35 feet and then forking again. The larger of these branches, some 15 inches in diameter, was struck by the lightning, which stripped it completely of its bark, scattering the fragments in all directions to a distance of about 30 yards from the tree and splitting it from the fork above to where it joins the main trunk, the fracture being about 30 feet long. The other main branch of the tree was uninjured. The elm is a fine tree about 90 feet high with a trunk 4 feet in diameter. The lightning made two straight splits or bruises in the bark on opposite sides of the trunk for about 40 feet from the base upwards. The bark is about an inch thick and is of course very tough; the wood below the bark does not appear to have been injured. In both trees the upper parts are apparently uninjured. In August, 1895, a Kew deodar, 45 feet high, was destroyed by lightning.

Hand-list of Ferns and Fern Allies.—A new edition of the *Hand-list of the Ferns and Fern Allies cultivated in the Royal Botanic Gardens, Kew*, has been issued. Since the publication of the previous edition in 1895 some change has taken place in the composition of the Fern collection. The species that have been acquired since 1895 are included in the new edition; those not now in cultivation at Kew have been omitted. A feature of the new edition is the provision of references to publications in which reliable figures of some of the species may be found.

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The preface to the previous edition, which includes an interesting table prepared in 1867 by Mr. J. G. Baker, F.R.S., to show the percentage of the total number of ferns that had been collected in different parts of the world, is reprinted. In the preface to the new edition there is a similar table drawn up by Mr. C. H. Wright, A.L.S., to whom the preparation of the list for the press was entrusted, which shows the percentages to be derived from our present knowledge of the groups dealt with. It is not yet possible to provide absolute percentages, but those in Mr. Wright's table, which are given for comparison with those in Mr. Baker's earlier one, may be taken as approximately accurate.

The tables referred to, showing percentages of the total number of ferns found in different parts of the world, are as follows :—

A.—Drawn up by Mr. J. G. Baker, F.R.S., in 1867.

Arctic Zone	1 per cent.
Europe	4 „
Temperate Asia, including Himalayas ...	18 „
Temperate North America	5 „
Temperate South Africa	7 „
Australia and New Zealand	9 „
South Temperate America	5 „
Tropical Africa	15 „
Tropical Asia	39 „
Tropical America	42 „

B.—Drawn up by Mr. C. H. Wright, A.L.S., in 1906.

Arctic Zone	·4 per cent.
Europe	2·5 „
Temperate Asia, including the Himalayas above 8,000 ft.	25·5 „
North Africa, Canary Islands	·8 „
Temperate North America	3·2 „
Temperate South Africa	4·5 „
Australia and New Zealand	6·9 „
Polynesia	10·8 „
Temperate South America	2·7 „
Tropical Africa and Mascarene Islands ...	15·2 „
Tropical Asia	34·8 „
Tropical America	46·4 „

Botanical Magazine for January.—The plants figured are :—*Asparagus Spengeri*, Regel; *Cynorchis compacta*, Reichb. f.; *Oxalis adenophylla*, Gill.; *Colchicum crociflorum*, Regel; and *Wittmackia lingulata*, Mez. The *Asparagus* is figured in the fruiting state; the flowering state of the same plant had previously been figured under the name *A. ternifolius*, Hook. f. The species is of as great decorative value when in fruit as when in flower. *Cynorchis compacta* is a graceful little terrestrial orchid first discovered in Natal by Mr. J. Sanderson about 1869, and rediscovered in 1895 by Mr. J. M. Wood. The plants figured were

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presented to Kew by Messrs. Sander & Sons. *Oxalis adenophylla*, a native of Chili, closely allied to *O. enneaphylla*, Cav., from Fuegia and the Falkland Islands, from which it differs chiefly in having a bulb-like rootstock and differently coloured petals, is a graceful species with rose-coloured purple-eyed flowers. The plant figured was presented to Kew in 1902 by Mr. H. J. Elwes. *Colchicum crociflorum* is a beautiful little species with crocus-like flowers, the pure white ground of each lobe relieved by a broad central band of pink which gradually becomes dark purple. The corms from which the plants figured were raised were imported from Kokan by Mr. C. G. van Tubergen, jun., of Haarlem. *Wittmackia lingulata* is a rather striking American plant first described as a species of *Bromelia* by Plumier in 1703, and included by Philip Miller in the 7th edition of his Dictionary as in cultivation in 1759. It seems, however, never to have been commonly cultivated and it has rarely been sent home by collectors. The plant figured was grown in the Royal Botanic Gardens, Glasnevin, and communicated by Mr. F. W. Moore.

Botanical Magazine for February.—*Eulophia nuda*, Lindl., is a very variable species, native of India, (where it is widely distributed), Ceylon, and Yunnan in Western China. Its flowers are rather large and vary in colour from rose-purple to pink and pale green. The figure was prepared from plants presented to Kew by Mr. A. H. Hildebrand, C.I.E., late Superintendent of the South Shan States. *Saxifraga scardica*, Griseb., from the Balkan Peninsula, is similar to, but more showy than, *S. burseriana*, L. The plants figured were purchased from Mr. F. Sündermann, of Lindau, Bavaria. *Iris sieheana*, Lynch, is one of Mr. W. Siehe's introductions from Asia Minor. It chiefly differs from *I. persica*, Linn., in the colour of the flowers, which are silvery-gray, densely covered with fine reddish lines. At Kew it commences to flower in a south border in February. *Lonicera pileata*, Oliv., native of Central and Western China, whence it was recently introduced by Messrs. James Veitch & Sons, is a dwarf evergreen species belonging to a small section characterized by the calyx possessing a curious cap-like production at its base. It is quite hardy at Kew, where its small pale yellow flowers appear in April. The Chinese *Prunus triloba*, Lindl., is an old inhabitant of English gardens, having been sent to Europe by Fortune about the middle of last century. The plant figured was raised from seed received from Prof. Sargent in 1890. The double-flowered form of this species is one of our best hardy flowering shrubs.

Botanical Magazine for March.—*Arachnanthe annamensis*, Rolfe, is a particularly striking orchid which has recently been introduced from Annam by Messrs. F. Sander & Sons, of St. Albans. It flowered in the Royal Botanic Garden, Glasnevin, in June, 1905. The pretty *Erica terminalis*, Salisb., is a hardy species from Southern Europe, well-known in gardens under the name of *E. stricta*. *Lonicera tragophylla*, Hemsl., was figured from a

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specimen sent by Messrs. Veitch in June, 1905. It is quite hardy and is the most showy of all the Chinese species, resembling the European *L. Caprifolium*. *Polygala apopetala*, T. S. Brandegee, is a handsome shrubby or arborescent species from Lower California, where it is abundant in the Sierra de Laguna. The specimens, bearing long racemes of bright rose-purple flowers, were communicated by Sir Thomas Hanbury, K.C.V.O., of La Mortola. *Ceropegia fusca*, C. Bolle, is a native of the Grand Canary, where it has recently been re-discovered through the instrumentality of Mr. Walter Ledger, of Wimbledon, who sent the plant to Kew from which the drawing was prepared. It is somewhat anomalous in habit, and when not in flower might easily be mistaken for one of the succulent-stemmed Euphorbias.

Botanical Magazine for April.—*Nepenthes Phyllamphora*, Willd., is interesting as being the most widely distributed of all the species of the genus and the first to be cultivated at Kew, having been introduced in 1789. It is found over a very wide area in Eastern Tropical Asia and Western Polynesia. Its pitchers are nearly cylindrical, and are from 3 to 7 inches long. The Kew plant figured came from the Island of Hainan, South China, and was sent by Mr. C. Ford, I.S.O., in 1894. *Gladiolus carmineus*, C. H. Wright, is a new South African species allied to *G. hirsutus*, Jacq. Bulbs were received at Kew in 1903 from the Hon. Sir C. Abercrombie Smith, Controller and Auditor General, Cape of Good Hope. *Ligustrum strongylophyllum*, Hemsl., is a distinct species with small suborbicular or ovate leaves and large terminal inflorescences. A plant purchased from Messrs. James Veitch & Sons in 1897 flowered at Kew in July, 1905. It is a native of Central China. *Cypripedium tibeticum*, King, is a terrestrial species, native of Eastern Tibet and Western China. The cultivated plants were received by Messrs. Veitch from Western Szechuen in April, 1905, and flowered in the open air at Coombe Wood in the following June. *Callopsis Volkensii*, Engler, is a stemless plant with cordate leaves and white spathes about an inch long. It belongs to the *Aroidae* and is a native of German East Africa. The plant figured was received from the Berlin Botanic Gardens in 1905.

Botanical Magazine for May.—*Lilium Duchartrei*, Franch., is a fine addition to the number of handsome Lilies previously brought into cultivation, several of which, like the present one, are natives of China. Bulbs of *L. Duchartrei* were introduced from West Szechuen by Messrs. James Veitch & Sons, who supplied the material figured. *Primula cockburniana*, Hemsl., is another of Messrs. Veitch's introductions from China, where it grows at high altitudes in West Szechuen. It is chiefly remarkable on account of the colour of the flowers—a rich orange-red, which is not accurately represented in the figure. *Listrostachys hamata*, Rolfe, is a distinct new species from Tropical West Africa, allied to the South African *L. arcuata*, Reichb. f. It is peculiar in having a hooked tip to the spur. This interesting plant was included in a small collection of

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orchids received at Kew from Lagos in 1899, and presented by Mrs. W. T. Martin. *Genista dalmatica*, Bartl., native of the North-Western Balkan Peninsula, is a small rigid spinous shrub with terminal racemes of yellow flowers. *Euphorbia lophogona*, Lam., is a curious plant from Madagascar. Its stem is succulent except the woody base, five-angular, and crested on the angles with the deeply-cut persistent stipules. The cymes are large, on erect peduncles, and the upper pair of bracts of each cyathium are pink or white. The Kew plant was received from the late Mr. Godefroy-Lebœuf.

Catalogue of Portraits of Botanists.—An addition to the series of *Hand-lists* to the various collections in the Royal Botanic Gardens, of much interest and value, has been issued under the title *Catalogue of Portraits of Botanists exhibited in the Museums of the Royal Botanic Gardens.* In a preface, Sir William Thiselton-Dyer, to whom all botanists will feel indebted for the inception of the catalogue, gives an account of the formation of this in many ways unique collection, and explains the object and scope of the work. The gratitude of workers in every field of botanical activity, who are interested in the personalities of those who have laid the foundations on which their own work is built, will also be extended to Mr. J. D. Milner, for the admirable manner in which the catalogue has been prepared. The preface is as follows :—

"The collection of portraits of botanists at Kew is probably "unique. It has always been regarded with much interest by "visitors to the establishment, especially by those from the Colonies, "and the interest to which it appeals is varied ; it may be historical "as in the case of the men who were pioneers in the scientific "exploration of our Indian and Colonial possessions; or literary in "respect to the great founders of different branches of botanical "science ; or scientific in regard to the men who have in more "recent times conspicuously advanced its progress.

"The history of the collection is brief. It was commenced in "the early part of the last century by Sir William Hooker, when "Regius Professor of Botany in the University of Glasgow. In "1841 he was appointed the first Director of the Royal Botanic "Gardens on their becoming a national establishment. He brought "the collection with him. The following account is given of it "in a memorandum which he drew up shortly before his death "in 1865.:—

"'Of Portraits of Botanists mine is the only extensive collec-"'tion and it is very valuable. It consists of 17 Chalk Drawings, "'chiefly by MacNee, of Glasgow, a few Oil Paintings and Minia-"'tures, numerous engravings, lithographs, silhouettes, &c., of "'distinguished Botanists, also some Bronze and other medals, "'medallions, &c., amounting to about 100.

"'A considerable number of Chalk Drawings having been lent "'by me to the Museums of Economic Botany in the Royal "'Gardens, are now suspended on the walls of the Staircase of the "'new Museum. They are all of public interest in a scientific

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" 'point of view, and their value can be easily ascertained. I " 'desire that they should be offered for purchase to Her Majesty's " 'Government.'

" The Government eventually decided to purchase it for Kew " with the rest of Sir William Hooker's collections. Provision was " made in a supplementary estimate for 1866–7. The sum given " was £1,000, but the actual collection purchased appears to " have been larger than that indicated in Sir William Hooker's " memorandum.

" It has since been added to by occasional purchases. But the " main increase has been by gifts and bequests. This alone is " sufficient evidence of the appreciation of the collection by the " intelligent public, or at any rate by the botanical world. It " may be noted that as far as available the portraits are cited in " Britten and Boulger's *Biographical Index of British and Irish* " *Botanists.*

" When the collection was small it was easily displayed on the " walls of the old staircase of the principal Museum (No. I.). But " as it grew somewhat indiscriminately it overflowed to adjoining " walls and ultimately to other buildings. It became obvious that " this could not be continued indefinitely. It was therefore decided " to divide it into an exhibited series and one which could be " readily consulted in the library. In each case the portraits are " as far as possible mounted on a uniform plan and arranged " alphabetically ; in the latter they are kept in portfolios.

" In 1904, with a view to the preparation of the present catalogue, " the exhibited collection was carefully revised. Regard was had, " in this, to the relative eminence of the persons represented and " in some degree to the artistic merit of the portraits themselves. " Those, however, of men who had had historic or close personal " relations with the establishment were, as far as possible, included.

" The crayon portraits executed for Sir William Hooker by " Sir Daniel MacNee in his youth are of exceptional interest. " They represent the very remarkable group of men who, largely " under the influence of Sir William Hooker, laid the foundation " of the botanical traditions of modern Kew.

" By the kind permission of Lionel Cust, Esq., M.V.O., F.S.A., " Director of the National Portrait Gallery, the present catalogue " has been drawn up by Mr. James D. Milner, the Clerk and Acting " Assistant Keeper and Secretary, in his leisure time. Not merely " has it had the advantage of being prepared by a practised hand, " but the form and method adopted enable it to take its place " beside those of other collections.

" Mr. Milner, in executing his task, has bestowed upon it an " amount of pains and research which goes far beyond anything " which could have been demanded of him. He has made it in " fact a labour of love, and I am persuaded that the result will be " found, not merely useful as a guide, but a trustworthy manual " of botanical biographies.

" It has had the further advantage of being read in proof by " Mr. Daydon Jackson, the General Secretary of the Linnean " Society, who has kindly undertaken the labour, and whose know- " ledge of the history of botanists is altogether unequalled.

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"The collection is shown in Museum No. I. It is as far as "possible arranged alphabetically, beginning on the top floor. For "the sake of completeness a few other memorials preserved else- "where are included. In these cases the building is indicated in "brackets. Those hung in the Herbarium have a special and "intimate relation with the work of that department."

While no effort has been spared to ensure the absence of error it is hardly possible to hope for absolute accuracy or completeness in a work that involves the citation of so many dates. In a few instances, those of Mrs. Aiton, wife of W. Aiton, of A. W. Roth, and of James Thornton, "the King's Gardener at Kew," neither the date of birth nor the date of death is given; in others, those of A. Cruckshanks, of T. Drummond, and of Professor R. Scott, the date of birth is unknown; in a few more cases, those of J. Arnold, L. Fuchs and J. Haverfield, Junr., the date of birth requires confirmation. In the case of Roth the dates appear to be 1757-1834.

Owing to an undetected typographical error the date of Mr. J. G. Baker's first appointment to the Herbarium at Kew is given as 1886 instead of 1866. In the case of Dr. John Sims the dates 1792–1838, taken from Pritzel's *Thesaurus*, ed. 2, p. 298, are incorrect; the true dates are 1749–1831. It has also to be noted that Chabraeus, p. 27, was son-in-law to J. Bauhin; the text inadvertently reverses the connection between these two botanists. The communication of dates to fill the lacunae indicated, and the correction of any errors that may be detected in addition to those now pointed out will be welcomed. It ought to have been noted, on p. 87, that the bust of the late Miss North is to be found in the Gallery, presented by her to the nation, which contains her magnificent collection of botanical paintings.

Additions to the Herbarium during 1901.—Donations of specimens were made by more than one hundred persons and institutions, and amounted to about 12,000 sheets. The specimens purchased amounted to over 6,500. The principal collections are enumerated below.

VARIOUS PARTS OF THE WORLD. *Presented*:—Herbarium of the late Mr. W. Mathews, by Mrs. Mathews; Fungi, by M. A. Jaczewski; Erysiphaceae, by Mr. E. S. Salmon; Hepaticae, by the Rev. C. H. Binstead.

Purchased:—Dr. C. F. Arnold, Lichens.

EUROPE. *Presented*:—Faeroe Islands, by Mr. C. H. Ostenfeld; "Herbarium Florae Rossicae," fasc. xiii.–xviii., by the Botanical Museum, Imperial Academy of Sciences, St. Petersburg; "Flora Exsiccata Austro-hungarica," Cent. xxxiii.–xxxiv., by the University Botanical Museum, Vienna; "Kryptogamae Exsiccatae," Cent. vii., by the Imperial Natural History Museum, Vienna; Bosnia and Bulgaria, by Mr H. J. Elwes; "Hieraciotheca gallica et hispanica," fasc. x.–xi., by M. G. Gautier; "Hepaticae Galliae," fasc. ix., by M. T. Husnot.

Purchased:—Rabenhorst, "Fungi Europaei," ser. II., Cent. xliii.; Linton, British Hieracia, fasc. vi.; Dahlstedt, Scandinavian

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Hieracia, Cent. xii.-xiii.; Kneucker, "Carices Exsiccatae," lief. viii.-x.; "Cyperaceae et Juncaceae Exsiccatae, lief. ii.; "Gramineae Exsiccatae," lief. vi.

NORTH AFRICA. *Presented:*—Egyptian and Algerian Salsolaceae, by Dr. G. Schweinfurth.

NORTH AND CENTRAL ASIA. *Presented:*—Siberia, by Mr. H. W. Arnell; Central Asia, by Imperial Botanic Garden, St. Petersburg; Thian Shan Mountains, by Mr. St. George R. Littledale.

CHINA AND JAPAN. *Presented:*—Henry, Morse and Ducloux, China, by Dr. A. Henry; Hong Kong, by Mr. W. J. Tutcher; Japanese Mosses, by Dr. Kingo Miyabe.

Purchased:—Okamura, "Algae Japonicae Exsiccatae," fasc. i.

INDIA. *Presented:*—N. W. India, by Mr. J. F. Duthie.

MALAYA. *Presented:*—By Botanic Gardens, Singapore; by Botanic Gardens, Buitenzorg.

Purchased:—Andrews, Christmas Island; Zimmermann, Siam.

AUSTRALIA. *Presented:*—Goadby, Western Australia, by Miss Morgan; Western Australia, by Dr. Alexander Morrison.

Purchased:—Pritzel, Western Australia.

TROPICAL AFRICA. *Presented:*—Gold Coast, by Mr. W. H. Johnson; Punch, Lagos, by Sir W. MacGregor, K.C.M.G., C.B.; Nile Land, by Mr. C. E. Muriel; Uganda, by Sir H. H. Johnston, G.C.M.G., K.C.B.; Abyssinia, coll. by the late Captain Wellby, by Mr. J. H. Wellby; Zanzibar, by Mr. R. N. Lyne; Lake Nyassa, by the Ven. Archdeacon W. P. Johnson; do., by Miss E. Kenyon; Purves, Nyasaland, by Mr. J. McClounie.

Purchased:—Zenker, Cameroons; Baum, South West Africa.

SOUTH AFRICA. *Presented:*—Cape Colony, coll. by the late Mrs. Hugh Jameson, by Miss E. M. Piesse; Cape Colony, by Dr. H. H. Bolus; do., by Major Wolley Dod; Transvaal, by Sir J. Kirk, G.C.M.G., K.C.B.; Restiaceae, by the Manchester Museum.

Purchased:—R. Schlechter, S. Africa.

NORTH AMERICA. *Presented:*—Colorado, by the New York Botanic Garden; California, by the Department of Agriculture, Washington; Canadian Carices, by Mr. C. B. Clarke; Yukon and Montana Mosses, by the New York Botanic Garden; Fungi of Florida, by Mr. H. H. Hume; Crataegus, &c., by the Arnold Arboretum.

Purchased:—Cusick, Oregon; H. M. Hall, California; A. Nelson, Wyoming; Earle, New Mexico; Bush, Missouri, Arkansas and Texas; Harper, Georgia; Curtiss, Southern United States, ser. vii.; J. C. Arthur, "Uredineae Exsiccatae et Icones," fasc. iii.; Grout, North American Mosses.

CENTRAL AMERICA. *Presented:*—Mexico, by the United States National Museum; British Honduras, by Mr. E. J. F. Campbell.

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Purchased:—Pringle, Mexico; Townsend and Barber, Mexican coll. of 1899; Pittier, Costa Rica.

SOUTH AMERICA. *Presented*:—Brazil, chiefly Bignoniaceae, by the Imperial Botanic Garden, St. Petersburg.

The most important accession was a series of collections from various parts of China, amounting to nearly three thousand specimens, collected by Messrs. Morse, Ducloux and Henry, and presented by the latter. A valuable contribution made by the Imperial Botanic Garden, St. Petersburg, was a set of Riedel's Brazilian Bignoniaceae, determined by Schumann, and quoted by him in Martius, "Flora Brasiliensis," vol. VIII., pars II.

Medallion Portrait of Sir Joseph Hooker.—A special gold medal was awarded by the Linnean Society in 1898, at the Anniversary Meeting, to Sir Joseph Dalton Hooker, G.C.S.I., C.B., F.R.S., "in recognition of the services rendered by him to science during "60 years of unremitting labour." The obverse of the medal is a bust of Sir Joseph to the left, from life, by Frank Bowcher, with the legend J. D. H. Æt. LXXX. The reverse shows a wreath of Sikkim Rhododendrons surrounding an inscription which records the presentation, designed by John Pinches, by whom the medal was struck.

The artist's original model was three times the size of the medal. Bronze castings of this were made; one of these was added to the Kew collection of portraits of botanists in 1899 as the gift of the President and Council of the Linnean Society. This copy finds an appropriate place in the general collection of portraits. The presentation of another copy of this medallion portrait has now to be noted. This copy is the gift of the artist, Mr. Bowcher, who has asked that it may find a place in the visitors' room at the Herbarium, where so much of Sir Joseph Hooker's work has been done.

Presentations to the Library during 1901.—Thirty-nine dissertations have been received from Dr. Hans Schinz, who has also presented several books and pamphlets including: *Jaccard, Catalogue de la Flore Valaisanne*, 1895; *Leist, Ueber den Einfluss des alpinen Standortes auf die Ausbildung der Laubblätter*, 1889; *Lesquereux, Catalogue des Mousses de la Suisse*, 1845; *Minks, Symbolae Licheno-mycologicae*, Theil 1, 1881; *Winckler, Geschichte der Botanik*, 1854; several papers from the *Neue Denkschriften der allgemeinen schweizerischen Gesellschaft*, by Cramer, Naegeli, and others; and the continuation of the *Mitteilungen aus dem Botanischen Museum der Universität Zürich*. Some of the works included in Dr. Schinz's gift are scarce and consequently not easy to procure. From the Trustees of the British Museum have been received vol. ii., part 2, of the *Catalogue of the African Plants collected by Dr. F. Welwitch*, which contains the Cryptogams, elaborated by various authors; also the second part of the *Illustrations of the Botany of Captain Cook's Voyage*; and *Catalogue*

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of the Mesozoic Plants in the Department of Geology, British Museum, part 1, by A. C. Seward. The following works from the library of the late Mr. James Huntingford Morgan, were presented by Miss Morgan: *Blenkarn, British Timber Trees*, 1862; *Hooker, Sir W. J., Kew Gardens, or a popular Guide to the Royal Botanic Gardens of Kew*, ed. 17, 1858; 3 volumes of McIntosh's Gardening Works, 1838–1839; and *Thornton, A Grammar of Botany*, 1811. From Mr. Geo. Nicholson were received: *Hoare, Calendar of Flowering Shrubs and Trees; Maund, The Botanical Souvenir*, which is a selection of coloured figures from *The Botanist* by the same author; and the *Transactions of the English Arboricultural Society*, vols. i.–iv. Besides the continuation of about 20 serial publications the Bentham Trustees have presented a nice clean copy, in a paper cover, of one of P. Belon's rarer works *De arboribus coniferis*, etc., 1553; also *L. Fuchs, Commentaires tres excellens de l'hystoire des plantes*, etc., 1549; and a fine copy of *The Herefordshire Pomona*, by R. Hogg and H. G. Bull, 1876–85. Fuchs' work is a French edition of *De historia stirpium*, published in Basle in 1542—a work famous for the excellence of the wood-cuts, which are reduced in size in the translation. To Prof. A. H. Church, Kew is indebted for the *Jahresberichte über die Fortschritte . . . der Agrikultur-Chemie*, 1858–99, 42 vols., and *Die landwirthschaftlichen Versuchs-Stationen*, 1868–1900, vols. 10–54, with subsequent volumes of both periodicals as they are published. Other contributions to the library are: *Ruiz Lopez, Memoria sobre las virtudes y usos de la raiz de Purhampuy ó China Peruana*, 1821, and *Triller, Diss. de corticis peruviani usu*, 1758, from Mr. W. Fawcett; *R. Sernander, Den Skandinaviska Vegetationens Spridningsbiologi*, 1901, from the Librarian, Royal University of Upsala; *F. M. Bailey, The Queensland Flora*, parts 3 and 4, from the author; *G. Barckhausen, Specimen botanicum sistens fasc. plantarum ex Flora Comitatus Lippiaci*, 1775, from Mr. B. Daydon Jackson; *J. Cardot, Mousses, et coup-d'œil sur la flore bryologique des Terres Magellaniques*, 1901, and *Recherches anatomiques sur les Leucobryacées*, 1900, from the author; *A. de Coincy, Ecloga quinta plantarum hispanicarum*, 1901, from the author; *Th. Cooke, The Flora of the Presidency of Bombay*, part 1, 1901, from the Secretary of State for India; *B. C. Cincinnato da Costa, O Portugal vinicola*, 1900, a finely illustrated folio work on the Vine, from the Secretary of State for Foreign Affairs; *E. De Wildeman, Observations sur les Apocynacées à latex*, etc., 1901, from the author. *E. De Wildeman and Th. Durand, Reliquiae Dewevreanae*, i., fasc. 1, 1901, and other publications of the Muséum du Congo, from the Secrétaire Général du Département de l'Intérieur, Brussels; *L. Diels, Die Flora von Central-China*, 1901, from the author; *J. Donn, Hortus cantabrigiensis*, ed. 12, 1831, from Mr. Spencer George Perceval; *E. L. Greene, Plantae Bakerianae*, 3 fascicles, 1901, from the author; *H. G. Hallier, Ueber die Verwandtschaftsverhältnisse der Tubifloren und Ebenalen*, etc., 1901, and another paper, from the author; *W. L. Jepson, A Flora of Western Middle California*, 1901, from Mr. J. Burtt Davy; *O. Lignier, Végétaux fossiles de Normandie*, 2 and 3, 1895 and 1901, from the author; *F. Niedenzu, Diss. de genere Banisteria*, pars 2, 1901, and *De genere Byrsonima*,

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pars. 1 [-2], 1897-1901, from the author; *Pliny, Historiae Mundi libri xxxvii.*, 1615, from Miss Catharine Sharpe; *R. Pound and F. E. Clements, The Phytogeography of Nebraska*, 1898, and ed. 2; 1900, from the authors; *Prodromus Florae Batavae*, vol. 1, pars 1, ed. 2, 1901, from the Nederlandsche Botanische Vereeniging; several papers from Mr. J. Barbosa Rodrigues and the late Dr. F. Sadebeck; *Sander's Orchid Guide*, 1901, from Messrs. F. Sander & Sons; *J. Wright, The Fruit Grower's Guide*, 1892, 3 vols., from Messrs. J. S. Virtue & Co.; *Biltmore Botanical Studies*, 1901, from the Director of the Biltmore Herbarium; *Annual Reports of the Cambridge University Department of Agriculture*, 1-3, 1898-1900, from Dr. Wm. Somerville; *Mittheilungen des Thüringischen Botanischen Vereins*, neue Folge, Hefte 1-15, 1891-1900, from the late Prof. C. Haussknecht; *Arboretum Amazonicum*, dec. 1 and 2, 1900, from the Director of the Museu Paraense; *Fauna, Flora and Geology of the Clyde Area*, edited by G. F. Scott Elliot and others, 1901, from the Acting Secretary of the Glasgow Meeting of the British Association. Sir Joseph D. Hooker, G.C.S.I., C.B., has presented the continuations of several periodicals including the *Berichte der Deutschen Botanischen Gesellschaft* and the *Comptes Rendus . . . de l'Académie des Sciences, Paris.*

In addition to the above the library has received numerous pamphlets presented by their respective authors and a number of periodicals sent in exchange.

Hortus Veitchii.—Noteworthy among recent gifts to the library is a copy of the superior edition of a book bearing the above title, compiled by James H. Veitch and distributed by the well-known firm of James Veitch & Sons, of Chelsea. As the title states, it is a history of the rise and progress of their nurseries, together with an account of the botanical collectors and hybridists employed by them, and a list of the most remarkable of their introductions. The paper, typography, and illustrations of this handsome volume of 500 pages are of the best, but it has a greater value as a record of the achievements of a firm foremost in this country for its enterprise and for its support of botany through its travellers in all parts of the world. In addition to their ordinary duties of collecting seeds and living plants, they were instructed to dry specimens, not only of plants of probable commercial value, but also, so far as their time and means of transport permitted, those of purely botanical interest. The list of travellers begins with the well-known name of William Lobb, 1840 to 1857, followed by his brother Thomas, 1843 to 1860, and ends with that of E. H. Wilson, 1899 to 1905. Of the 22 collectors who travelled for the firm during this period, three were members of the family, namely, John Gould Veitch, 1860 to 1870; P. C. M. Veitch, 1875 to 1878; and James H. Veitch, the present Managing Director of the firm, 1891 to 1893. Through the liberality of Messrs. Veitch most of their travellers are represented in the Kew Herbarium, and some largely, notably the Lobbs, J. H. Veitch, and especially Wilson, whose dried collections comprised some 25,000 specimens, a complete set of which was presented to Kew, and it includes a very large number of novelties.

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From 1841, when the late Sir William Hooker became Director of Kew, the "Botanical Magazine" has been essentially a Kew publication, but the "Hortus Veitchii" contains a list of 422 plates for which Messrs. Veitch contributed the material, either directly or indirectly, as the original introducers.

In the sketches of the lives of the travellers and hybridists, as well as in the notes on the plants introduced by the firm, there are many facts of the greatest importance and value in the history of botany and gardening, and Messrs. Veitch deserve the thanks of all persons interested in these sciences for the admirable manner in which they have put them on record.

Flora of Tropical Africa.—The issue of another part of this work has to be recorded. This part (vol. iv., sect. 2, part ii.) concludes the elaboration of the Tropical African *Convolvulaceae* (pp. 193–206) by Mr. J. G. Baker and Dr. A. B. Rendle, and also contains the *Solanaceae* (pp. 207–261) by Mr. C. H. Wright, and the first part of the *Scrophulariaceae* (up to *Buchnera*) (pp. 261–384) by Mr. W. B. Hemsley and Mr. S. A. Skan.

The *Convolvulaceae*, the greater part of which was published in the first part of section 2 of volume iv., comprise 286 species in 28 genera. Among them are only 11 new species, all but two described by Dr. Rendle. The small number of novelties finds its explanation in the fact that the order has recently been studied by Dr. Hallier f., of Hamburg, who published a series of articles on it containing numerous descriptions of new species. The largest genus is *Ipomoea*, with 151 species. The definitions and the arrangement of the genera adopted by the authors coincide on the whole with the system proposed by Hallier f. in Engler's Bot. Jahrb. xvi. (1892), pp. 453–591.

Most of the genera have a wide distribution, extending either to the Indo-Malayan region or to tropical America or all over the tropics. There is, however, a distinct endemic element of generic rank comprising about one-quarter of the genera (with about 40 species) and developed mainly in the dry regions of East Africa.

The *Solanaceae* comprise 11 genera with 131 species, of which over 100 belong to *Solanum*. The only endemic (and monotypic genus) is *Discopodium*, ranging from Abyssinia to Fernando Po and Nyasaland. Five species, all of *Solanum*, have been described here for the first time. Most species of *Solanum* are peculiar to Africa, very few extending to Arabia or beyond it to Baluchistan or Scind; only three have a wide range outside Africa. Although the genus is so abundantly represented in America, there are only two species common to America and tropical Africa, and those two are weeds. Of the other genera, *Capsicum*, *Cestrum*, *Datura*, *Nicotiana* and *Schwenkia* represent a distinctly American element, and some of them have undoubtedly been introduced from America within historical times.

The *Scrophulariaceae* are represented in this part of volume ii. by 40 genera (their total, according to the Clavis, is 54) with 227 species. There are no new genera among them, but 31 new species

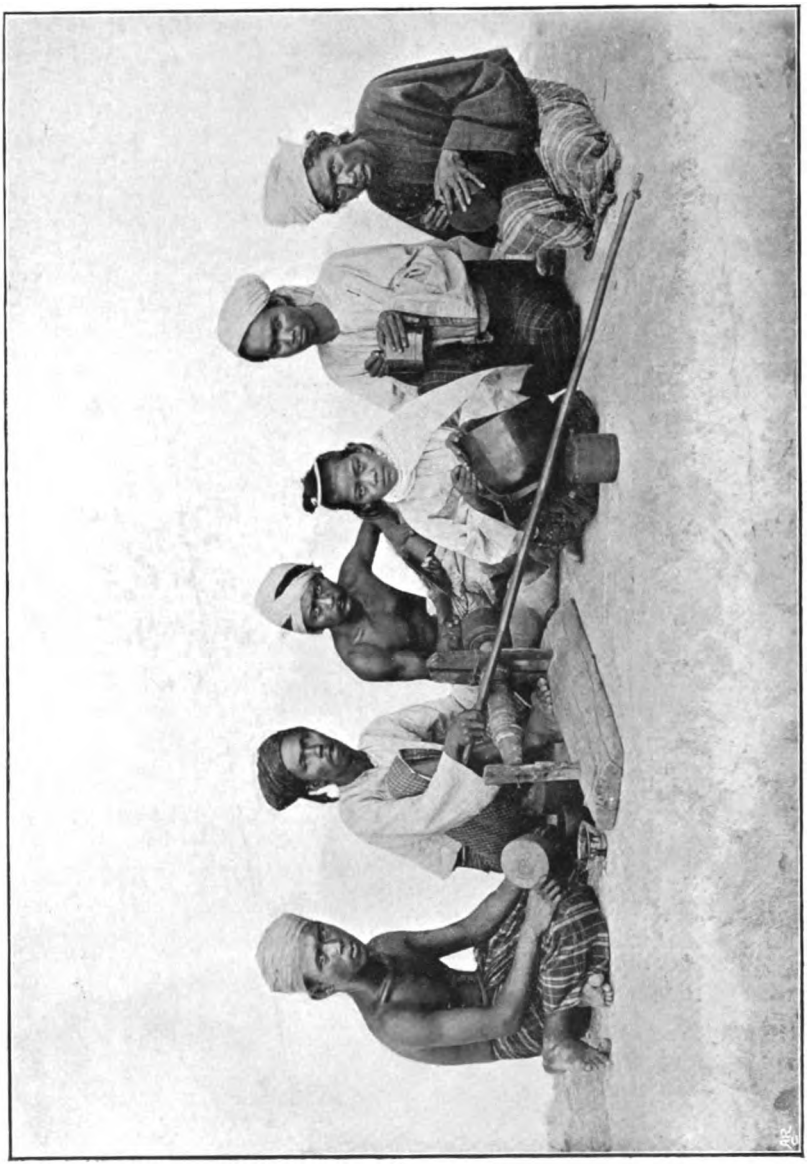
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are described by Mr. Skan, seven by Mr. Hemsley, and one by Mr. N. E. Brown. *Stemodiopsis* (two species in Nyasaland and one species in Somaliland) and the very singular submerged monotypic *Dintera* from Hereroland are the only endemic tropical African genera of *Scrophulariaceae* recorded in this part. A very strong South African element is represented by the *Aptosimeae*, *Hemimerideae*, and *Manuleae*, whilst a boreal element, much less numerous, enters with the *Antirrhineae*, *Verbascum*, *Scrophularia*, and *Veronica*. The *Gratioleae* (74 species), on the other hand, constitute a palaeotropic component, most of the genera having a wide distribution in the tropical and sub-tropical regions of the Old World. Very singular is the occurrence of the Andine *Hydranthelium egense* in two localities (one in Southern Nigeria, the other in the Congo State).

Flora of the Malayan Peninsula.—Numbers 16, 17, and 18 of Sir George King's "Materials for a Flora of the Malayan Peninsula" were issued at the beginning of the year, bringing the work down to the *Pedaliaceae*. In these, as in the numbers 14 and 15, Mr. J. S. Gamble is associated with Sir George King. No. 16 begins with an account of the genus *Psychotria*, of which twenty-nine species are described, eleven of them being new. It also contains the natural orders *Valerianaceae*, *Compositae*, *Stylidiaceae*, *Goodenoviaceae*, *Campanulaceae*, *Vacciniaceae*, *Ericaceae*, *Epacridaceae*, *Plumbaginaceae*, *Monotropaceae* (by Lieut.-Col. Prain), and *Gentianaceae* (by Mr. C. B. Clarke). These orders include only forty-eight genera and eighty-one species, of which two and seventeen respectively are new. The new genera are: *Pernettiopsis*, King and Gamble (*Ericaceae*), of which there are two shrubby epiphytic species; and *Microrphium*, C. B. Clarke (*Gentianaceae*). The relative poverty in *Compositae* is striking. It is true that twenty-three genera are represented, but eighteen of them by only one species each. Altogether there are only thirty-one species, which are mostly weeds of cultivation; not one is peculiar to the Peninsula. No. 17 contains the *Myrsinaceae*, *Sapotaceae*, *Ebenaceae*, *Styraceae*, and *Oleaceae*, comprising twenty-four genera and 221 species. There are no new genera, but nearly half of the species were previously undescribed. No. 18 contains the natural orders *Hydrophyllaceae* to *Lentibulariaceae*, the *Bignoniaceae* and the *Pedaliaceae*. With the exception of the *Boraginaceae*, by Sir G. King, and the *Hydrophyllaceae* and *Bignoniaceae*, by Mr. Gamble, this part is the work of Lieut.-Col. D. Prain. Fifty-three genera and 150 species are described, none of them for the first time, and comparatively few species of these orders are peculiar to the Peninsula.

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GROUP OF PAGAN LACQUER-WARE WORKERS.

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ROYAL BOTANIC GARDENS, KEW.

BULLETIN

OF

MISCELLANEOUS INFORMATION.

No. 5.] [1906.

XXIV.—BURMESE LACQUER WARE AND BURMESE VARNISH.

(*Melanorrhoea usitata*, Wall.)*

(With Plates.)

The tree that affords the Burmese Varnish is a large deciduous species met with in the open forests of Manipur, Burma, and Siam, often abundant in the forests of which the In (Eng) tree (*Dipterocarpus tuberculatus*) is the most characteristic species, more rarely met with in dry forests. It is a member of the natural family *Anacardiaceæ*, and bears the following vernacular names —*thit-si* or *thit-tse* (Burm.), *khéu* (Manipur), *suthan* (Taleing), *kiahong* (Karen). In addition to yielding a varnish, the timber of the tree is valuable, being fairly extensively used, in the countries where met with, in the construction of tool-handles, anchor-stocks, furniture, &c.; it has been recommended for gun-stocks, &c. Gamble observes that it is handsome and worthy of being better known.

In the Gazetteer of Upper Burma and the Shan States, written by Sir James George Scott, repeated mention is made of *Melanorrhoea* varnish (*thit-si*). It is commonly found in the Mawk Mai district. In the May Myo sub-division the black varnish is one of the chief forest products. Much *thit-si* is still extracted in Monghong State. *Thit-si* is very abundant in the zones of forest in which the oak is merging into the *in-gyin* forest. It is universally collected, and one seldom sees a tree that has not been tapped outrageously. It is all consumed locally and

* Melanorrhoea usitata, *Wall., Pl. As. Rar.* i., 9–12, *t.* 11, 12; *Fl. Br. Ind.* ii., 25; *Engler in DC., Phanerog*, 1883, *IV.*, 237–8; *Gamble Man. Ind. Timbs.* 217; *Brandis, Ind. Trees*, 202; *Watt, Ind. Art at Delhi* 1903, 218–24; *F. N. Williams, List of the Plants of Siam in Bull. L'Herb. Boiss. 2nd Series Vol.* v. 1905, *p.* 220; *Dict. Econ. Prod. Ind.* v., 207–10; *Seringe, Bull. t.* 4; *Pierre, Fl. For. Cochinchin, t.* 367B.

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there is no export. Such are some of the passages given by Sir James. During the Burma-Manipur Expedition of 1882, the writer was resident in the *Kabu* valley for some two months and took every opportunity to study the tree and the methods employed in tapping it. The Manipuris put great value in the varnish, and employ it extensively in forming a sort of patent leather, the varnish being used as the enamel for their harness and belting leathers. Their sword scabbards are also richly coated with the varnish, but curiously enough the bulk of the material produced in the forest on the Burmese side of the State is conveyed into Burma. In no part of Manipur is the clever art of lacquering basket-ware practised, which is carried to such perfection in Burma.

The sap obtained from the tree is essentially therefore, a Burmese product, so far as British possessions are concerned. In the Forest Administration Reports repeated mention is made of it, among the minor forest products. It is exported mainly from Pegu, also the Northern and the Southern Circles. In the report for 1900–01 mention is made of exports to the extent of 197,505 viss; in the following year the traffic fell to 85,000, and in 1902–03 was returned as being only 65,900 viss. These figures by no means, however, represent the total traffic, as they take no cognisance of production in private forests or of local consumption. There would appear to be no exports to India and practically none to foreign countries.

Review of Existing Literature.—Fully two hundred years ago interest appears to have been first aroused in Europe in the materials used in Japanese and Chinese varnish. Shortly thereafter also a few writers claimed the discovery of the selfsame material obtained from certain trees found in America. (*Cf. with Plukenets' Alm. Bot.* 1690, *p.* 45 *et Phyto. t.* 145, *f.* 2, *and Dillenius, Hort. Eltham*, 1732, *p.* 390). Kæmpfer described fully both the plant from which the varnish was procured and the method of its preparation in Japan (*Cf. Amœn. Exot.* 1712, *pp.* 191–5 *and plates*). The true varnish tree (and the varnish itself), he tells us, was known as *Sitz* or *Sitz-dsju*, but there was a false kind known as *Fasi no ki*. The former is *Rhus vernicifera*, a plant with which we are at present not concerned. Incidentally, however, we obtain in the dissertations of Japanese varnish the first suggestion of the existence of a Siamese and Burmese varnish and varnish tree. The Abbé Mazeas published in the Philosophical Transactions for 1755 (*p.* 157) a brief account of the Toxicodendrons or poison-trees of America, more especially the black dye which they afford. This drew a response from Philip Miller, published in the same volume of the Transactions. Miller reviews the discoveries and opinions of Kæmpfer, Dillenius, Catesby, Dudley, and Sherrard, more especially the fabled reputation of the plants in question as virulent poisons. In the Transactions for 1756 (*p.* 866) this was followed up by Mr. John Ellis, who wrote an article on "*An Attempt to Ascertain the Tree that yields the Common Varnish used in China and Japan; also to Promote its Propagation in our American Colonies*," and arrived at the conclusion that Miller and others who identified Kæmpfer's Japanese plant as being identical with the North

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American species were in error. Ellis then states that Father D'Incarville had sent seeds of the Chinese varnish tree from Pekin, and that the plant was at that time being grown in the Chelsea Physic Garden.

All the above-mentioned authors follow Kæmpfer in discussing an inferior quality of varnish produced in Siam and Cambodia which was supposed to be obtained from an *Anacardium*, "the *Tonj Rak* that is tree *Rak*, the fruit of which is in our shops called *Anacardium* and in Cambodia known as *Lak Rak* and the varnish as *Nam Rak*." But it would now appear highly likely that the plant so indicated was in reality *Melanorrhoea usitata*. This opinion at all events seems to have been accepted by M. E. Spach (*Hist. Nat. des Veget.* 1834, *II.*, *p.* 202), who calls it "the Melanorrhoea varnish of Siam." Subsequent authors identified the Cambodia *Rak* of Kæmpfer as being *Semecarpus Anacardium*, but that plant has not, so far as I can discover, been recorded as met with in Burma nor in Siam, and is not likely therefore to be prevalent in either country. On the other hand, Williams (*l.c.*) speaks of the *Melanorrhoea* tree as met with across Siam from the River Salween to the River Mekong—"the plant which in Burma and Siam furnishes the largest quantity of *Mai rac*." There would thus seem no doubt that the *Melanorrhoea* of Wallich was the *Anacardium* and *Semecarpus* mentioned by the older authors as affording a varnish in Siam and Burma.

It is known to yield a brown gum and the wood is said to contain an acrid juice which causes much irritation to the parts of the body exposed to it, hence the wood-cutters object to fell the tree. That property is, however, possessed by many others of the same family, such as one or two species of *Rhus*, and in India more especially *Holigarna Helferi*—a tree of Chittagong and Burma, which has so evil a reputation that it can hardly be felled. The juice of *Semecarpus*, while it has been spoken of as being a natural varnish (*Hurst, Painter's Colours, Oils and Varnishes*, 1901, *p.* 470), so far as India is concerned never appears to be so used, though the pericarp affords the well-known marking-ink of the Indian laundry-men.

In the Edinburgh Journal of Science (*Vol. VIII.*, 1828) there appeared an article on *The Varnish and Varnish Trees of India*, written apparently by the editor—Sir David Brewster. He there describes a varnish made by Mr. Swinton in Sylhet said "to consist *two* parts of the juice of the *Bhela* (the *Semecarpus Anacardium*—the tree which bears the marking-nuts of India) and *one* part of the juice of the *jowar*. Articles varnished with it at Sylhet are of a most beautiful glossy black, and it seems equally fitted for varnishing *iron*, *leather*, *paper*, *wood*, or *stone*." The varnish in question was doubtless that of the plant here dealt with and not a preparation of *Semecarpus*.

Sir David then discusses "the *Tsi-tsi*, or varnish of Rangoon, which, he says, is less known than the Sylhet varnish. Mr. Swinton considers it to be made from the juice of the *Bhala* or *Semecarpus Anacardium* alone." "The varnish from the *Kheeoo* or varnish tree may be the same as the Rangoon varnish, but it is at present considered to be different. The *Kheeoo*" (*khiu*, as we

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would now write it) "grows particularly in the Kubboo, a valley on the banks of the Ningtee between Munnipore and the Birman empire."

Sir David Brewster concludes his observations by a reference to Dr. Wallich's discoveries of the Burma varnish tree and then narrates certain experiments that he had himself performed with the varnishes of Burma and Sylhet. A small quantity of each was placed between two plate glasses and the plates pressed together till the thin film of varnish became transparent. Upon examining this film through a powerful microscope it was observed the fluid was not "homogeneous" but "organised," and "consisted of immense congeries of small parts which exhibited the finest example of mottled or striated colours. These particles dispersed the sun's rays in all directions like a thin film of unmelted tallow or like organised fluids such as blood and milk." "After standing two days exposed to the action of the air, I found," continues Sir David, "that the portions which the air did not reach, viz., between the glass plates, exhibited the same constitution as before, while that which was squeezed out between the glasses and on which the air freely acted had become of a fine colour like that of treacle. I now placed this portion between two plates of glass, and found, to my great surprise, that the organised structure of the fluid was entirely gone, that it was perfectly homogeneous and showed the sun of a beautiful red colour. The action of the air had completely disorganised the vegetable juice and reduced it to a condition of complete fluidity."

These results speak for themselves, and I reproduce them *first* because they give the key to the industrial utilization of the varnish, and *second* because hardly any other observer in the eighty odd years that have since transpired can be said to have published much of greater interest than these simple experiments regarding this much neglected substance.

The next account of the varnish, in historic sequence, is that given by Dr. N. Wallich, in his *Plantæ Asiaticæ Rariores* (1830). He there narrates his discovery of the plant at Prome, Tenasserim, &c., and determines the Manipur and Sylhet plant described by Swinton, Grant, and Smith as being one and the same with the Burmese varnish tree for which he gave the name *Melanorrhoea usitata*. According to Wallich, the person who first made known this substance was Mr. M. R. Smith, who sent in 1812 particulars regarding the tree to Mr. H. Colebrooke, from which it has to be inferred that the so-called Sylhet varnish of Swinton and others was in reality Manipur varnish brought into India *viâ* Sylhet, hence called by that name.

Perhaps the next mention of this substance occurs in the Proceedings of the Committee of Commerce and Agriculture of the Royal Asiatic Society for 1838, in which the Secretary invites the attention of the Committee to the Burmese varnish (*thitsi*) which Dr. Wallich had identified as being the same as the *kheu* or Varnish-tree of Manipur.

Extraction of Sap.—Sir D. Brandis (*Indian Forester*, *I.* (1876) 362–7) furnished a highly instructive paper called "Notes on the

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Burmese Varnish," which gives a more complete account of the separation of the sap and the production of the crude varnish than has been furnished by any subsequent writer. He speaks of the tree as resembling in foliage the Burmese *Semecarpus*. "The process of extraction was described to me by a Shan who had settled at Tyemyouk four years ago, and had, like many thousands of his countrymen, emigrated from Upper Burma into British territory with his entire family. Near Myouk, six miles further north, *Thitsee* is collected by the Burmans, also emigrants from Ava." "The trees which have been tapped are at once known by triangular scars about 9 inches long and 5 inches broad, the apex pointing downwards. On some trees we counted 40 to 50 of these scars and some of them at a height of 30 feet." The notches, to extract the varnish, are made with a peculiarly shaped iron chisel 15 inches long. "With this instrument two slanting slits, meeting at an acute angle, are made upwards through the bark, and the triangular piece of bark between the two slits is thus slightly lifted up, but not removed. A short bamboo tube about 6 inches long with a slanting mouth and a sharpened edge is then horizontally driven into the bark below the point where the two slits meet, and the black varnish, which exudes from the inner bark near its contact with the wood, runs down into the bamboo tube, which is emptied at the end of 10 days, when it ceases to flow. A second cut is then made so as to shorten the triangular piece of bark which had been separated from the wood when the first cuts were made. A shorter triangular piece of bark remains, ending in an angle less acute than before." The edges of the original cut are made afresh, and the bamboo tube raised a little near the new scarification. "The varnish then runs out for another 10 days, after which the scar is abandoned. The trees vary in yield exceedingly. A crooked tree with scanty foliage, which we examined, was said to yield a good out-turn, while some of the largest trees were said to yield very little. We saw trees tapped which had a diameter of only 9 inches." One man could make and look after 1,200 scars and could do 200 in a day, so that the whole number would occupy 6 days which would leave 4 days for rest. They only work in those parts of the forest where the tree is abundant, and the trees fit to tap stand close together. "The tree yields nothing while it is leafless in the hot season, and the best season for working is from July to October. One man collects 40 to 50 viss (146 to 182 lbs.) in one season. At Tyemyonk the viss sells at 12 annas and at Rangoon for 1 rupee."

Localities of Supply and Materials used.—Mr. H. E. Tilly, in his most interesting and highly artistic book on the *Glass Mosaics of Burma* (1901)—an art which depends very largely on the utilization of *thit-si*—says, "It is not an art indigenous to Burma, but was introduced from Siam after an invasion of that country by Naungdawpaya, son of Alaungpaya, and to this day some of the best masters of the craft are Shans." The close resemblance of the Burmese name *thit-si* to the names *sitz* or *sitz-dsju*, given by Kæmpfer as the Japanese for the varnish of that country (a substance derived from a closely-allied plant to the varnish tree of Burma), is perhaps more than a coincidence. It is also somewhat significant that the modern Japanese name appears to be quite

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different, namely, *Urshi-no-ki* (*Cf. Useful Pl. Jap.* 1895, *p.* 87; *Rein, Industries of Japan, pp.* 158–64 *and* 338–77). Tilley says that the best qualities of the *thit-si* come from the Shan States and cost Rs. 2–8-0 a viss. Mr. N. K. Fraser speaks of the best qualities coming from the Chindwin and Shan countries. The quality known as *a-young-tin thit-si* is procured in Burma itself. In certain stages an oil is largely used which is composed of one proportion of *thit-si* and half a portion of Shan oil—the oil of Sesamum known as *Shansi*.

Mr. H. E. Tilly, in an article on lacquer-ware in Burma (*Cf. Mukharji's Art Manufactures of India, pp.* 259–60), says, "The lacquer-ware used in British Burma is of two kinds; (1) that in which the article is made of basket-work lacquered over; (2) that in which the article is made of wood." In Lower Burma the trade is largely confined to the latter class such as the large round platter with a raised edge, in which the family dinner is served, round and square boxes and bowls. Max and Bertha Ferrars (*Burma, pp.* 101–3) speak of "the exudation of the bark of *Melanorrhoea usitata*, a common tree of the *In* forests. The gum blackens to jet on exposure to the air. It dries slower than the 'Japan black' of Commerce but is much tougher. A peculiarity of *thissi*" (*thit-si* of other writers) "is that it sets hardest in a moist atmosphere. Every manufacturer has an underground cellar —a thing almost unknown in Burma—for the wares to harden in. Pagan, the centre of the industry, is at the same time the driest locality of the dry zone."

The materials used are the oleo-resin *thit-si*. This is often employed in a liquid state as a varnish, or it is thickened by saw-dust, cow-dung ashes, or bone-ashes to a plastic condition and used as a cement, a body material, or moulding substance. It may be coloured with lamp-black, with gold leaf, with vermilion (not red lead), with orpiment, with indigo, &c., and may be applied with a brush or by the hand direct, or to an object revolving on the turning lathe. It has been affirmed that the coating with vermilion-coloured varnish must be done in the sun, not in the shade, otherwise the red colour will be destroyed. The more liquid forms may be utilized as varnish to wood-work or to make paper or cloth waterproof (as in the manufacture of Burmese umbrellas), or when thickened can be used as putty to fill up defects in wood-work, or to close the meshes of basket-work, horse-hair work, &c., in order to convert these into water-tight drinking-cups, betel-leaf boxes, &c.; or it may be the cement employed in the manufacture of glass mosaics, and lastly, and by far its best known purpose, it is the chief material in the production of Burmese lacquer-ware.

Mr. N. K. Fraser furnished a most interesting report on this industry in 1889, in which he says the bamboo in most general use is the *Tinwa* (*Cephalostachyum pergracile*). The workman starts by dividing the bamboo into separate parts, retaining one knot of the bamboo to each part. Each is now taken and split down the middle, each half being again sub-divided into what is called *hni-laung*. The knot is now cut off from each *hni-laung*. The finest splitting is effected by cutting from the root end of

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each *hni-laung* towards the top. These specially prepared *hni-laungs* are now deposited in water for three days, in order to soften the bamboo. When this has been accomplished, the bamboo is now ready for splitting into slender strips as desired. The inner and outer bark of the bamboo from each *hni-laung* is first stripped off and thrown away. The outside strips taken from each piece are used for the ribs of the basket, the inside ones for the weaving of the frame-work. The baskets are worked over a mould and are commenced by four longitudinal strips being laced together and other eight longitudinal strips, half the thickness of the four chief ones, being fixed in their positions. The four long strips are now divided each into three, the middle division being removed and the eight subsidiary strips are split each into two. The fine transverse strands or weft of the text are now woven within the longitudinal warp and the structure formed as closely on the mould as possible. When complete the key of the mould is removed by which the mould may now be separated in pieces.

Ferrars very truly remarks that so accurately and beautiful are the Burmese wicker-work baskets made that "at first sight it appears incredible that these exact cylindrical boxes with their trays and covers, fitting as if each piece had been turned out of the block, should start from a wicker-work frame. Yet so it is; the models are plaited so true that the rest of the work can be done on a lathe. To prepare the wicker for lacquering, it is first given a rough-stuffing of fine clay to fill the interstices. The work is then painted with *thissi*, which penetrates and toughens the clay and binds the fibres of the wicker. When the *this-si* has set, which takes several days, the work is put on the chuck of a bow-lathe and ground smooth with a fibrous stone. Varnishing and grinding are repeated till the surface is smooth, colour being added to the later coats."

There may be said to be two main stages in the work: 1st. Loading the articles with the thickened *thit-si*. All the imperfections are filled up by a putty made of the commoner sort of *thit-si* mixed with saw-dust or cow-dung ashes. Layer upon layer, for some 20 to 30 times, the *thit-si* is applied, while bits of cotton rags are stretched across and around joints and cracks (if the lacquer is being applied to wood-work) and thus imbedded within the *thit-si*. After each application the article is laid aside for a few days to dry slowly in the damp confined atmosphere of the underground pit. It is again and again removed and washed in water, rubbed down, smoothed, polished with sand-paper and a peculiar red mud, and again coated with fresh layers of *thit-si*. If circular, it is placed on the turning-lathe (Plate 1, second artisan from the left) and gauged to the required size.

2nd. When the desired degree of loading and colouring has been obtained, the articles are rubbed all over by the hand with a fine quality of Shan *thit-si* varnish, and this may be repeated many times, the articles being rubbed down and varnished until the required degree of polish has been attained.

Chief Methods and Centres of Thit-si Work.—There are four chief types of lacquer-work and centres of production. These are (1) Pagan basket-ware; (2) Prome gold lacquer boxes and

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baskets; (3) Mandalay boxes, thrones, &c., with moulded lacquer ornamentations; (4) Burmese mosaic work; and (5) Manipur varnished wares.

1st. **Pagan Ware.**—This is mainly if not entirely done on basket-ware or horse-hair boxes. The lid of a large wicker-work box is shown on Plate 2 (fig. 3) and a betel-nut box (fig. 4). These have been ornamented as follows:—An article prepared as above described is put on the turning-lathe and the gloss of the varnish removed, thus leaving a perfectly smooth surface. It is then handed over to the designers and engravers, often young girls such as the one shown in the centre of the group (Plate 1). By means of a fine metallic scriber a certain portion of the pattern is engraved all over, the spacing and assortment being done unerringly by the eye and without any previous delimitation or drawing.

After being engraved the article is handed to another operator, who places it on the turning-lathe, and taking a small quantity of some dry metallic pigment in the hand, rubs it all over, and thus loads the engravings with the colour. The excess is rubbed off and the colour fixed by a coating of varnish. Or it may be that the colour is given in the liquid form of a varnish, the excess of which is removed, leaving the tinted pattern within the original ground colour. After being placed aside to dry, the article is handed back to the engraver, and other portions of the design are scratched or chiselled out and loaded with their special colours and thereafter varnished. Time after time this process is repeated until all the colours desired have been added and the design completed. The article is then given one or two final coatings of varnish. Such is the process as witnessed by me in Pagan in 1903, but it will be seen to differ in some respects from that given by other observers.

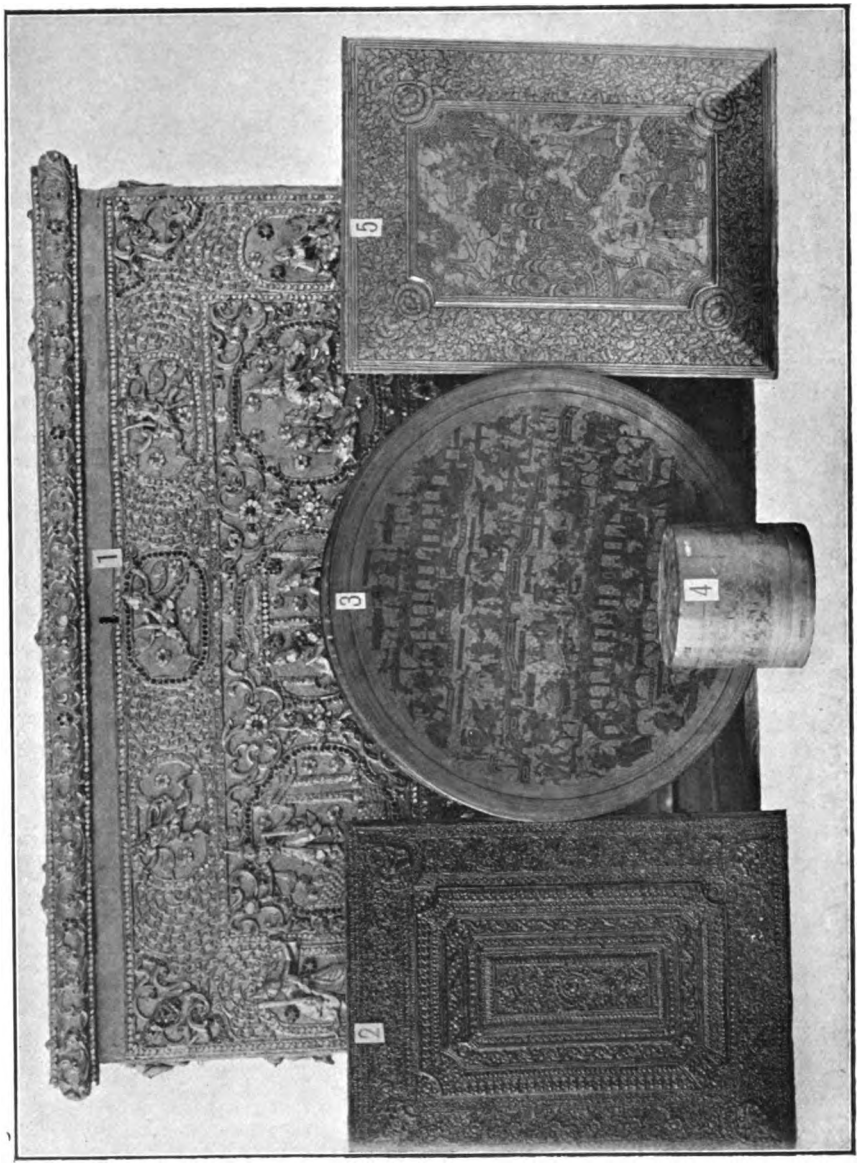
Mr. Rories communicated through the Conservator of Forests, Southern Circle, Burma, a highly instructive report in December, 1900. He indicates 25 stages of work before the betel-box is complete. One interesting circumstance mentioned may be here added to the above abstract account, namely, that after being coated with each layer of *thit-si*, 3 to 6 days are usually sufficient for it to dry, but in hot weather a longer period may be necessary—namely, up to 15 days.

The patterns followed by the Pagan workers are as a rule overburdened. There is an entire absence of any knowledge in the value of spacing or of contrasts. Their designs, as will be seen from Plate 2, fig. 3, recall strongly the Chinese willow pattern—rivers, bridges, boats, trees, assorted in zig-zag panoramic effects, within winding panels. The trees shown are mainly the plantain and cocoanut, and the scroll-work employed recalls forcibly the Chalukyan and Dravidian of Mysore and Travancore, but has little in common with the Hindu and Muhammadan conventional arts of India.

2nd. **Prome Ware.**—After an article has been prepared according to most of the stages above indicated and left in its final varnishing as black or red, it is re-varnished and gold leaf pressed on to the partially dried *thit-si* sizing. This would give gold lacquer. But

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REPRESENTATIVE GROUP OF BURMESE LACQUER-WARE.

(1) Mandalay moulded work; (2) embossed work; (3) and (4) Pagan ware; and (5) Prome gold lacquer.

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if it be contemplated to elaborate a pattern in gold lacquer, or any portion of it, a paint is prepared of finely powdered orpiment and gum. By means of a brush this is applied to the black or red surface, a picture being painted with this special orpiment paint, but the design must be complete before the coating of *thit-si* has set completely. The whole is then coated over with gold or silver leaf and the article placed on one side to dry. It is next carefully washed in water, when the elevated designs in paint soften and are carried away, thus revealing the black or red original colour constituting the picture upon the now gold or silver background.

This art is practised in Prome, and constitutes the gold and silver lacquer-ware for which that town is famous. The usual design is that shown, Plate 2 (fig. 5), a central panel in quasi-Chinese willow pattern, framed in scrolls of closely compacted floral ornamentations.

3rd. **Mandalay Moulded Lacquer.**—In Mandalay and elsewhere in Upper Burma one of the most interesting uses of *thit-si* may be studied. The Oleo-resin is thickened with carefully prepared rice husk or cow-dung ashes, until it attains the consistence of putty. In this condition it is perhaps one of the most convenient and useful moulding materials known. A stone or board, previously dusted over with fine ashes, is used as the moulding table. The *thit-si* is then broken off in lumps of the required size, and between the fingers is readily and easily moulded into the form of the bodies of animals, each leg, arm, finger being separately made and stuck on in the desired attitude. By means of a few specially made wooden modelling tools, the details are sharpened up, and when ready the figure is lifted off the table and transferred to the freshly sized surface on which it is to be affixed permanently. It is then given a few finishing touches before being varnished over with *thit-si* and placed in the pit to dry. Plate 2 (fig. 1) shows a *Hpungi* (or priest's box), the outer surface of which has been richly ornamented in the manner described. It will be observed also that certain medallions in the design have been studded with coloured glass or minor gems imbedded within the soft *thit-si*.

This art is largely used for the ornamentation of fancy boxes, idol thrones, as also the stands on which *hpungi* coffins are deposited. The same material and method is often adopted in the ornamentation of the many-storied and many-trayed baskets in which Burman ladies store their treasures and jewels. The foundation of these is, of course, wicker-work lacquered over, in the manner described in connection with Pagan ware, with, in addition, moulded work round the outer surfaces and along the rims, elaborated in rich scrolls and grotesque animals and other floral and animal designs. In the preparation of these scrolls or mouldings blocks are largely used. The *thit-si* is rolled into strips of the desired thickness, then placed on the table and a mould of soapstone pressed over the top. The material is thus compressed into border pieces or ribbons, which, like the insertions in embroidery or the metallic braidings used in Europe for similar purposes, may be taken up and laid along as required, and, as they soon set with the size, become permanently secured as surface

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ornamentations. The work is thus rapid and easily accomplished, the effect charming, and the capabilities infinite, on lines not dreamt of in Burma.

For portfolio covers, panels of wood are coated with *thit-si* and embossed with the greatest ease. This form of moulding material is usually made with bone-ash as the thickening substance. A thick layer is placed over the sized plaque or other object, and while still plastic a soapstone mould is pressed home. If it be desired to illuminate portions of the design, the mould is removed and pieces of coloured glass pressed into the portions where coloured elaborations are deemed necessary. It is then allowed to set, and may be sized and gilded or coloured in any fashion desired, and finally varnished over and placed aside to dry slowly. Plate 2 (fig. 2) shows portfolio boards with a rich design in black moulded lacquer resembling the most elaborate carved black ebony work.

4th. **Burmese Glass Mosaics.**—From Siam came the art of wall decoration by coloured glasses imbedded in a layer of *thit-si* putty. While this is practised all over Burma, the examples of the Great Pagoda of Rangoon are far superior to the mosaics of the other pagodas. Reference has already been made to Mr. Tilly's most excellent work on the "*Glass Mosaics of Burma*," and the reader should consult that work for illustrations of this remarkable art. The putty used for ordinary work is made of the common grades of *thit-si* thickened with saw-dust. For finer work the *thit-si* is boiled until it begins to crackle, when it is sprinkled with water and allowed to cool. It is then thoroughly mixed with cow-dung ash and beaten on a block of wood with a stick, ashes being added until the right consistency is obtained. It must be used while fresh and before it hardens. This fine putty is then formed into long strips one-tenth of an inch in thickness and is slightly powdered with fine ashes. Ornaments are next constructed of it (in the manner described in connection with Mandalay moulded work) and applied to the larger mosaics of wall decoration as may be desired. With glass mosaic generally, coarse saw-dust *thit-si* is laid on the plastered wall until an even surface is obtained. It is then varnished over with liquid *thit-si* and allowed to dry. The surface is next rubbed down with a smooth stone. The pattern is now marked on the prepared surface with powdered chalk. The glasses, ready cut, are each given a small coating of *thit-si* on the back and pressed firmly on to the part of the design which they are each intended to occupy. Cords of *thit-si* putty are now placed around and between each piece of glass and carefully moulded with the knife so that they become not only the final binding portions of the *thit-si* but the finishing touches in the design. The whole is lastly coated over with liquid *thit-si*, and if the dividing lines are intended to be gilded, gold leaf is pressed on to the size before it has had time to set. The glass surfaces are then cleaned, when it is found that the most elaborate designs have been traced on walls or around pillars, and as the material sets firmly it is remarkably durable.

5th. **Manipur Varnished Wares.**—Some few years ago a reference was made to Col. H. St. P. Maxwell, Political Agent of Manipur, for information and specimens of the utilization of the oleo-resin

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in that State. In consequence an admirable series of specimens (now deposited in the Indian Museum, Calcutta) and a report of great interest came to hand. The inquiry was conducted by Rai Rasik Lal Kundu Bahadur, Superintendent of the State. The *Kheu* trees he tells us are tapped by triangular incisions similar to those described by Sir D. Brandis in connection with Burma. The extract is collected in bamboo tubes. When sent to a distance it is placed in tins along with a little water to prevent the oleo-resin drying, but it is affirmed the water will not mix with the *kheu* nor will it in any way affect the quality of the same.

When intended to be used, the natural varnish is carefully strained through a piece of strong muslin. It is then mixed with a little more than its own weight of cow-dung ash, the two being well pounded in a mortar for about half an hour. It may then be smeared over the article of wood, stone, leather, iron, brass or other material that it is desired to lacquer. In the course of three or four days, in hot weather, the article will have dried sufficiently for the further stage to be proceeded with. It is rubbed with a stone and finally with the rough leaves of *Ficus Cunia* until it is quite smooth. It is then soaked in water and again polished with the leaves, and then once or twice coated with pure *kheu* varnish. This is prepared by straining the oleo-resin once or twice through cloth. The varnish is then quite liquid and is best put on by the hand. If this coating does not give the degree of polish desired, after being thoroughly dried, the article is again soaked in water, rubbed down by the fig leaves and coated a second or third time with the varnish. The proper season for varnishing is March to November.

Such are some of the chief uses of the sap of *Melanorrhoea usitata*, a varnish of great merit and immense possibilities that at present practically takes no part in the arts and industries of Europe and America.

GEORGE WATT.

July 5, 1906.

XXV.—SOME NEW CHINESE PLANTS.

An interesting and valuable collection of plants was made in China during 1899–1902, and again during 1903–1905, for Messrs. James Veitch & Sons by Mr. E. H. Wilson. The first set of this collection was very generously presented to the Herbarium at Kew by Messrs. Veitch, and it was hoped that eventually Mr. Wilson, in collaboration with Mr. W. B. Hemsley, might prepare a paper in which the whole collection could be systematically dealt with. Before, however, this undertaking could be completed, Mr. Wilson had to take up duties that render it impossible for him at present to continue his share of the work. As, however, the collection contains a number of obvious novelties, nearly all of which are of considerable interest, it has been thought desirable to publish descriptions of these without delay and in anticipation of the larger and more general contribution which it is to be hoped may eventually appear.

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Clematis Faberi, *Hemsl. et E. H. Wils.*; species habitu prostrato distincta, ceteroquin ad *C. Prattii*, *C. japonicam*, et *C. pogonandram* accedit, ab eis tamen foliis subcarnosis, foliolis integris, floribus luteis, sepalis carnosis et filamentis latioribus recedit.—W. B. H.

A small-growing prostrate species; old branches reddish, glabrous; young branches straw-coloured, pubescent. *Leaves* trifoliolate, including the petioles 6–8 cm. long; petioles pubescent; leaflets shortly petiolate, ovate, or obliquely-ovate, terminal one largest, 5 cm. long, 2·5 cm. wide, acute, entire, dark green above, glaucous beneath, sparsely pubescent, 3–5-nerved. *Flowers* yellow, solitary, axillary, ebracteate; peduncles slender, twining, 5–6·5 cm. long, sparsely pubescent. *Sepals* fleshy, suberect, elliptic, 2–2·5 cm. long, about 1 cm. broad, abruptly acute, pubescent inside. *Stamens* about 1·5 cm. long; filaments equally dilated throughout, with few or many scattered long hairs on the dorsal surface; anthers introrse, villous; staminodes none. *Style* plumose, half the length of stamens.

WESTERN SZECHUAN. On rocks, at elevations between 2700–3000 m., *Wilson*, 3125; summit of Mt. Omi, *Faber*, 731.

In a living state this is one of the most distinct of all the Chinese species of *Clematis*.—E. H. W.

By an oversight, Faber's 731 was referred (*Kew Bulletin*, 1892, p. 82) to *C. Prattii*, Hemsl., as were also Dr. A. Henry's 6817, which is *C. pogonandra*, Maxim., and 4920 and 6704, which are *C. otophora*, Franch.—W. B. H.

Clematis hupehensis, *Hemsl. et E. H. Wils.*; species ex affinitate *C. otophorae*, a qua foliis pinnatim 7-foliolatis, foliolis minoribus et staminibus pilis longis suberectis (nec patentibus) vestitis differt.—W. B. H.

A slender climber, glabrous except the flowers. *Leaves* pinnately 7-foliolate; petioles very slightly dilated at base, almost filiform as well as the petiolules; leaflets ovate, rounded at base, 2·5–5 cm. long, 0·5–2·5 cm. broad, acute, mucronate, entire, shining above, somewhat glaucous beneath, indistinctly 3-nerved. *Flowers* usually solitary, rarely three, on short axillary shoots, yellow, about 2·5 cm. across; peduncles slender, 4 cm. long, furnished with two small, opposite, elliptic bracts. *Sepals* suberect, ovate, acute, 2·5 cm. long, 8 mm. broad, glabrous outside, pubescent inside. *Stamens* shorter than the sepals, clothed with long suberect hairs, filaments equally dilated throughout; staminodes none. *Style* plumose, rather shorter than the stamens.

HUPEH. Mountains to the north-west, in woods and shrubberies, at elevations of 1500–2100 m., rare, *Wilson*, 2548.

This and *C. otophora*, Franch., are the only two yellow-flowered species of *Clematis* known from Central China. The two species may be easily distinguished by their very different foliage.—E. H. W.

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Anemone (§ Euanemone) Wilsoni, *Hemsl.*; species *A. baicalensi* similis, sed petiolis pilis longis patentibus brunneis sericeis vestitis, lamina subtus glabra ad medium trilobata et lobis rotundato-crenatis apiculatis differt.—W. B. H.

Rootstock stoloniferous. *Leaves* suborbicular with cordate base, distinctly trilobed; lobes crenately-toothed, teeth mucronate, under surface reddish-purple with scattered appressed yellowish hairs, upper surface green, sparsely pubescent; petioles slender, 10 cm. long, clothed with yellowish-brown villous hairs. *Scapes* 1-flowered, 8–15 cm. high, clothed with a pubescence similar to that of the petioles. *Involucre* about 4 cm. below the flowers; bracts 3, small, free, cuneate, usually trilobed; lobes acute. *Flowers* 2·5 cm. across, pale pink. *Sepals* 6–8, obovate, about 1 cm. long, rounded, the outer pubescent on dorsal surface. *Stamens* short; filaments 2 mm. long, simple. *Pistils* pubescent; stigma practically sessile.

WESTERN SZECHUAN. Woods and shady places at elevations between 2100–2700 m., *Wilson*, 3038.

This pretty woodland species suggests *Anemone Hepatica* in habit and size of flowers.—E. H. W.

Anemone (§ Euanemone) Millefolium, *Hemsl. et E. H. Wils.*; species habitu *A. albanae* sed ab omnibus speciebus hactenus descriptis foliis tripinnatisectis segmentis parvis numerosissimis longe recedit.—W. B. H.

Rootstock spindle-shaped, woody. *Leaves* rosulate, spreading, pilose below, oblong, 5–10 cm. long, 2·5 cm. broad, tripinnatisect, ultimate segments very small, acute. *Scapes* usually solitary, one-flowered, 15–20 cm. high, erect, pilose. *Involucre* about 5 cm. below flowers; bracts 3, cohering at base, 1–1·5 cm. long, deeply cut into linear segments. *Flowers* about 4 cm. across, rose-purple. *Sepals* 6, suberect, about 1·5 cm. long, 6 mm. broad, narrowly ovate-oblong, rounded at the tip, entire or toothed, more or less hairy on the outside. *Stamens* less than half the length of the sepals but overtopping the styles; filaments dilated at base. *Styles* densely clothed with white, silky hairs.

WESTERN SZECHUAN. Yalung Valley, at about 3000 m. in dry stony places, rare, *Wilson*, 3050.

A very remarkable species with foliage very like that of *Achillea Millefolium*, only smaller.—E. H. W.

MAGNOLIACEAE.

Michelia sinensis, *Hemsl. et E. H. Wils.*; affinis *M. obovatae*, ab ea foliis oblanceolatis, stipulis quam petiolis duplo triplove longioribus, bracteis floralibus hirsutis, petalis paucioribus et carpellis breviter rostratis differt.—W. B. H.

A hard-wooded tree, 6–15 m. high; bark pale grey. *Leaves* obovate-oblong or oblanceolate, narrowed into a short petiole, 10–15 cm. long, 5 cm. broad at greatest width, abruptly obtusely acuminate, strongly reticulate, glaucous beneath, at length quite glabrous, midrib somewhat tuberculate; petioles rather under 1·5 cm. long. *Stipules* caducous, narrowly oblong, acuminate,

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three times the length of petiole. *Flowers* solitary, axillary, shortly pedunculate, 5–7·5 cm. across, ivory-white, strongly aromatic; peduncles stout, 8 mm. long, annular, pubescent; bracts covered with brown hairs. *Sepals* and *petals* 10, spathulate to linear-oblong, rounded or acute. *Stamens* very caducous, 1·2 cm. long; filaments shorter than the anthers; anthers mucronate. *Carpels* when young minutely glandular-pubescent; stigmas red. *Fruits* 15–20 cm. long; carpels woody, subsessile, obovoid, lenticellate, shortly beaked.

WESTERN SZECHUAN. Mt. Omi and mountains to the westward, at about 1000 m., *Wilson*, 3136, 4720.

A handsome evergreen tree with conspicuous flowers. Rare and only met with in woods and forests of Western Szechuan.—E. H. W.

Schizandra pubescens, *Hemsl. et E. H. Wils.*; ab omnibus speciebus hucusque cognitis pilis plano-compressis crispis flaccidis unicellularibus recedit, ceterum *S. glaucescenti* proxima, a qua foliis majoribus non glaucescentibus, venis primariis subtus prominentibus, sepalis petalisque orbicularibus extimis pubescentibus et filamentis latissimis differt.—W. B. H.

Stems angular, purple, glabrescent. *Leaves* papyraceous, ovate or suborbicular, including the petioles 9–12 cm. long, 4–6 cm. broad, rounded or cuneate at base, acutely acuminate, remotely toothed, ultimate veins terminating in minute callous teeth, glabrous above, below, as well as the petiole, clothed with short, flattened curled appressed hairs; primary veins prominent below. *Flowers* white, 2 cm. across, solitary, axillary; peduncles very slender, 4 cm. long. *Sepals* and *petals* 9, broadly obovate to orbicular. *Stamens* about 15, closely imbricated; filaments fleshy, oblong or almost square; anther-cells widely separated. *Pistil* of numerous carpels winged on the ventral line; styles short, simple, deciduous. *Fruit-carpels* subsessile, 1- or 2-seeded, 5–6·5 cm. long, orange-coloured, pendulous; axis fleshy, cylindrical.

HUPEH. Changyang, *Wilson*, 2234; Patung, *Henry*, 1785; Chienshih, *Henry*, 5907.

This species is not uncommon on the margins of woods and shrubberies in South-Western Hupeh, at elevations between 1200 and 2200 m. The attractive yellow flowers are succeeded by the still more conspicuous orange-red fruits.—E. H. W.

MENISPERMACEAE.

Cocculus heterophyllus, *Hemsl. et E. H. Wils.* (nomen novum). *Cocculus* (?) *diversifolius*, Miq. in Ann. Mus. Bot. Lugd.-Bat., vol. iii., p. 10; Prol. Fl. Jap., p. 198, non DC.

HUPEH. Nanto and mountains to the northward, *Henry*, 2014, 2590; Ichang and immediate neighbourhood, *Henry*, 4105; Nanto and other localities, *Wilson*, 1203, 1203*a*, 1483, 1483*a*, 2267, 2675.

SZECHUAN. Mt. Omi, *Wilson*, 4718.

Also in Japan.

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Some of the specimens are very similar in foliage to *Pericampylus incanus*, Miers, but easily distinguished by the elongated inflorescence usually exceeding the leaves. Of the numerous specimens examined none bears female flowers.—W. B. H.

BERBERIDACEAE.

Berberis Wilsonae, *Hemsl.*; species adspectu *B. Thunbergii* similis, differt spinis infra foliorum fasciculos 3, foliis crassissimis eximie reticulatis fieres excedentibus et floribus numerosis minoribus in racemos congestos dispositis.—W. B. H.

A deciduous semi-prostrate shrub, 1 to 2 m. high. *Stems* angular, reddish-brown, puberulous. *Leaves* fascicled, coriaceous, subsessile, cuneately-obovate or linear-oblong, 2–2·5 cm. long, entire, revolute, rounded or slightly truncate and emarginate, mucronate or obtusely acute, tapering into a very short petiole, glabrous, glaucescent below, strongly reticulated on both surfaces. *Stipular spines* always 3, acicular, rather under 1·5 cm. long. *Flowers* bright yellow, in sessile umbels or shortly stalked corymbs, bracteate; bracts small, scale-like, concave, shortly acuminate; pedicels erect, 4–6 mm. long. *Sepals* 6, obovate-orbicular, 2–3 mm. long, outer whorl half size of inner and reddish; veins prominent. *Petals* 6, obovate, rather smaller than the sepals, rounded, obtuse. *Stamens* shorter than the petals. *Stigma* shortly stipitate. *Fruit* globose, salmon-red, 1–4-seeded.

WESTERN SZECHUAN. Scrub-clad mountain-sides, 900–1800 m., *Wilson*, 3154, 3147. Henry's 4675 from Patung, Hupeh, is probably this species.

Remarkable amongst the Chinese species of *Berberis* for the brilliancy of its autumnal tints.—E. H. W.

Berberis verruculosa, *Hemsl. et E. H. Wils.*; inter species foliis simplicibus munitas *B. pruinosae* proxima, a qua cortice verruculoso, floribus majoribus solitariis vel binis, sepalis petalisque carnosis venosis et filamentis crassis clavatis facile distinguitur.—W. B. H.

An evergreen shrub, about 1 m. high. *Stems* yellowish, scabrid, densely covered with short thick, rigid hairs. *Leaves* in fascicles, coriaceous, subsessile, ovate or ovate-lanceolate, 1·5–2·5 cm. long, about 1 cm. broad, sharply acute, base narrowed to the very short petiole, remotely toothed, teeth sharp, spinescent, shining above, glaucescent below. *Stipular spines* always 3, acicular, 1–2 cm. long. *Flowers* solitary or in pairs, yellow, over 1 cm. across; pedicels erect, 4–10 mm. long, surrounded at base with a cluster of reddish scale-like bracts. *Sepals* and *petals* concave, broadly obovate to orbicular, rounded, entire, base shortly clawed, prominently nerved. *Stamens* 6; filaments stout, 2 mm. long; anther-cells short, widely separated. *Fruit* violet-purple, oval, crowned with the sessile stigma.—E. H. W.

WESTERN SZECHUAN. Mountains around Tatien lu, in shrubberies, *Wilson*, 3150, 3150*a*.

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Berberis (§ Mahonia) Veitchiorum, *Hemsl. et E. H. Wils.*; a *B. nepalensi* et *B. eurybracteata* foliolis multidentatis a basi pinnativenosis, racemis densioribus brevioribusque bracteolis auguste lanceolatis longe acuminatis flores excedentibus differt.—W. B. H.

An erect shrub, about 1 m. high, glabrous in all parts. *Leaves* coriaceous, 15–30 cm. long, shining above, yellowish below, 3–6-jugate; leaflets sessile, oblong, 5–10 cm. long, 4–4·5 cm. wide, acuminate, mucronate, base oblique, entire, regularly spinescent-dentate; lowest pair of leaflets small, terminal leaflet largest, oblong-ovate, base rounded; veins pinnate and reticulate; petioles very short, sheathing; rhachis angular, swollen at the point of insertion of leaflets. *Inflorescence* racemose, terminal; racemes about 8, in a cluster, ascending, 5–12 cm. long, bracteate at the base; bracts oblong, acute, 1–2 cm. long, fibrous, persistent. *Flowers* yellow, about 1 cm. across, densely crowded on the racemes, bracteate; bracts subulate, acuminate, 8–12 mm. long, overlapping the flowers, membraneous, persistent; pedicels 2–3 mm. long, naked, erect. *Sepals* 6, outer 3 oblong, shorter than the inner; inner oblong-ovate, obtuse, 6 mm. long, prominently veined. *Petals* similar to inner sepals, but smaller. *Stamens* 4 mm. long; anther-cells short; filaments flattened. *Fruit* bluish-black, ovoid, 6–8 mm. long, crowned with the small, sub-sessile stigma.

WESTERN SZECHUAN. Cliffs 600–1800 m., *Wilson*, 3142. Mt. Omi, *Wilson*, 4725; *Henry*, 8993.

A rare and very remarkable species, known only from the neighbourhood of Mt. Omi. Its relatively large flowers and very long floral bracts give it a very distinct appearance.—E. H. W.

Podophyllum Veitchii, *Hemsl. et E. H. Wils.*; species foliis binis subcentrice peltatis saepius 8-lobatis, lobis acute trilobatis remote denticulatis, floribus inter folia opposita terminalibus et sepalis quam petalis paullo longioribus distinguitur.—W. B. H.

Stems erect, 12 to 20 cm. high, round, glabrous. *Cauline leaves* 2, opposite, papery, nearly centrically peltate, orbicular, about 20 cm. across, usually 6–8-lobed above the middle; lobes cuneate-oblong, often trifid at apex, sinus rounded or acute, irregularly coarsely toothed, ciliolate, slightly hairy below, upper surface glabrous, blotched with brownish-red. *Flowers* 3–6 in sessile terminal umbels; peduncles pendulous, 1·5–2 cm. long, pubescent. *Sepals* 6, membranous, 2 cm. long, caducous, oblong-obovate, rounded or subacute, outer whorl narrower and pubescent outside. *Petals* 6, purple, rather shorter than sepals, elliptic, rounded at apex. *Stamens* 6, slightly longer than petals; filaments very short and broad; connective fleshy, apiculate. *Pistil* half the length of stamens; ovary ellipsoid; style short, thick; stigma large, fringed. *Fruit* unknown.—E. H. W.

WESTERN SZECHUAN. In woods and forests, 2500 m., *Wilson*, 3170.

Podophyllum difforme, *Hemsl. et E. H. Wils.*: species e grege floribus extra-axillaribus distincta, fere undique glabra, foliis tenuissimis circumscriptione variabilibus excentrice peltatis, nunc

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semiorbicularibus apice vere truncatis, nunc varie lobatis asymmetricis inaequilateralibusque, lobis acutis remote calloso-denticulatis, floribus parvis, petalis tenuissimis discretis ligulatis obtusis.—W. B. H.

Rhizome slender. *Stem* 15–20 cm. high, glabrous. *Cauline leaves* usually two, alternate, rarely three with uppermost opposite, subequal, excentrically peltate, 5–11 cm. long, 7–15 cm. wide, papyraceous, glabrous, broadly truncate or occasionally more or less lobed, base more or less rounded, sparsely toothed, teeth mucronate, petioles subequal, 2·5–11 cm. long, glabrous. *Flowers* 3–5 in. pendulous, sessile umbels, extra-axillary, except when three cauline leaves occur; peduncles rather under 2 cm. long, recurved, pilose. *Petals* 6, salmon-pink, linear-oblong, about 1·5 cm. long, rounded. *Stamens* 6, half the length of petals, incurved, long apiculate; filaments half length of stamens. *Fruit* small, globose.

HUPEH. Woods at elevations between 1200 and 1800 m., *Wilson*, 966.

This delicate and rare species is the "Hsao Pâ-chiao-lien" of the Chinese. The rhizome is highly valued as a drug.

From the description of *P. Delavayi*, Franchet (Bull. du Mus. d'Hist. Nat., 1895, p. 63), we suspect that it is very near this, as our plant has sometimes only one fully-developed flower; but the leaves of our plant are always excentrically peltate and the petals are rounded, characters opposed to Franchet's description.—E. H. W.

CRUCIFERAE.

Cardamine (§ Eucardamine) Prattii, *Hemsl. et E. H. Wils.*; species ex affinitate *C. Griffithii* et *C. multijugi*, aquibus differt parvitate, foliis longe petiolatis, foliolo terminali 3–5-lobato, lateralibus oblique inaequilateralibus 2- vel 3-lobatis omnibus distincte petiolulatis, floribus albis majoribus numerosioribus et siliquis crassioribus.—W. B. H.

A creeping herb. *Flowering stem* ascending, 10–30 cm. high, rarely branched, usually pubescent. *Leaves* petiolate, pinnatisect, narrowly oblong, 6–7·5 cm. long, rather over 1 cm. wide, sparsely pubescent; segments obcuneate, acute, pinnatifid, terminal lobe palmately 3–5 lobed, 6 mm. long and broad, larger than the others, slightly cordate or truncate at base; petiole 1–2·5 cm. long, base dilated, pubescent. *Flowers* numerous, racemose, white, 1·5–2 cm. across. *Sepals* broadly ovate, sparsely pubescent. *Petals* spreading, four times the length of sepals. *Style* long, narrower than the pods. *Pods* 2·5–4 cm. long, stout.—E. H. W.

WESTERN SZECHUAN. Moist alpine meadows at 3300–3700 m., around Tatien lu, *Wilson*, 3199; *Pratt*, 265, probably from the same locality.

TERNSTROEMIACEAE.

Gordonia sinensis, *Hemsl. et E. H. Wils.*; haec species *G. Lasianthо* Americae borealis proxima, differt imprimis foliis majoribus acutis grosse serrato-crenatis, floribus minoribus, sepalis extra glabris et filamentis e comparatione longioribus fere liberis.—W. B. H.

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Tree about 12 m. high. *Leaves* ovate-lanceolate, including petiole 12–18 cm. long, 5–6·5 cm. broad, shortly acuminate, base cuneate, crenate-serrate, coriaceous, dark green above, paler, often brownish, below; primary veins 10–14 on each side of mid-rib, very prominent on both surfaces; petioles stout, rather under 1·5 cm. long. *Flowers* erect, solitary, axillary, pedunculate, bracteate, 5–6·5 cm. across, white; peduncles stout, angular, 4–4·5 cm. long; bracts 2, immediately below calyx, obovate 8 mm. long. *Sepals* orbicular, 3–5 mm. long, ciliolate, glabrous outside, silky-pubescent inside. *Petals* ovate or obovate, 2·5–3 cm. long, about 1·5 cm. broad, rounded, connate at base, glabrous save at base, which is silky-pubescent. *Stamens* adnate to, and about ⅓ length of petals; filaments flattened, subulate; anthers nearly globular. *Ovary* silky-pubescent, 5-lobed; style shorter than stamens; stigma large, capitate.

WEST SZECHUAN. Mt. Omi, rare, *Wilson*, 4805.

A strikingly handsome tree only met with on Mt. Omi. It is very distinct from all other Asiatic species, having a closer affinity with the American species *G. Lasianthus*, L.—E. H. W.

ICACINACEAE.

Hosiea, *Hemsl. et E. H. Wils.*; genus novum Icacinacearum ex affinitate *Natsiati*, a quo habitu vagante non volubili, inflorescentia laxe cymosa, floribus polygamis, petalis longe inflexis, nectarii squamis carnosis rotundatis, filamentis filiformibus, stylis productis, embryone aurantiaco crasso carnoso quam albumine tenui vix breviore, cotyledonibus ellipticis et radicula brevissima recedit.

Hosiea sinensis, *Hemsl. et E. H. Wils.*, sp. unica —— *Natsiatum sinense*, Oliv. in Hook. Ic. Pl., t. 1900.

HUPEH. *Wilson*, 638; Chiensih, *Henry*, 5598*b*; South Patung, *Henry*, 7342.

SZECHUAN. Mt. Omi, *Wilson*, 4957; South Wushan, *Henry*, 5598, 5598*c*.

We have contrasted this plant with *Natsiatum* because it has been referred to that genus, but in several characters it approaches more nearly to other genera. Thus, the inflorescence and flowers are more like those of *Chariessa*, Miq. (*Pleuropetalum*, Bl.).

SABIACEAE.

Meliosma Kirkii, *Hemsl. et E. H. Wils.*; species a *M. Arnottiana* foliis majoribus, foliolis numerosioribus in eodem folio forma variabilibus subtus pallidis apiculatis et panicularum ramis primariis horizontalibus recedit.—W. B. H.

Tree 12 m. high; young branches reddish, lenticellate, rusty-puberulous. *Leaves* pinnately 7–13-foliolate, including petioles 12–50 cm. long; leaflets subopposite, shortly petiolulate, oblong-lanceolate, 4–15 cm. long, 1·5–4·5 cm. broad, basal pairs often shorter and broader, acuminate and mucronate, remotely toothed, dark green above, glaucescent and pubescent below, primary and

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secondary veins prominent on under side; teeth mucronate; petiolules 6–10 mm. long, pubescent. *Panicle* 25 cm. by 45 cm., much-branched, terminal and axillary from the upper leaf axils; secondary branches of panicle horizontally disposed; all parts of panicle covered with short, rusty-grey indumentum. *Flowers* very numerous, densely clustered on the branches of panicle, white, shortly pedicellate; pedicels pubescent. *Sepals* 5, unequal, 2 outer the smaller, ovate, rounded, ciliolate, concave. *Petals* 5, 3 outer subvalvate, orbicular, rounded, concave, fugacious; 2 inner minute, scale-like. *Disk* cupulate, toothed. *Ovary* pubescent; style longer than stamens; stigma simple.

WESTERN SZECHUAN. At 800 m., *Wilson*, 2371.

A very handsome low-level tree, not uncommon in the woods around the base of Mt. Omi and the low mountains to the south-west. Its large panicles of white flowers make it a conspicuous object in the woods.

Named in compliment to William Kirk, M.D., of the Chinese Imperial Maritime Customs—a keen lover of nature and the collector's companion on many rambles.—E. H. W.

Meliosma Veitchiorum, *Hemsl.*; inter species foliis pinnatis munitas foliorum et panicularum amplitudine distincta, foliis maximis fere metralibus, foliolis usque ad 20 cm. longis, paniculis terminalibus ad 40 cm. longis, ramulis insigniter lenticellatis et floribus albis innumerabilibus.

A tree about 12 m. high, the young parts more or less clothed with a rusty pubescence. *Flowering branches* very thick and, as well as the branches of the panicles themselves, thickly studded with large lenticels. *Leaves* imparipinnate, the largest nearly 1 m. long, of which about a quarter is petiole; leaflets usually 9 or 11, the lower elliptical or almost orbicular, about 6 to 7 cm. across; upper ovate oblong, and as much as 20 cm. long; the leaves immediately under the panicles are much smaller. *Panicles* erect, narrowly pyramidal, much-branched, 40 to 45 cm. long. *Flowers* white, exceedingly numerous, about 3 mm. in diameter. *Sepals* oblong, obtuse, about 1·5 mm. long. *Petals* obcordate, crested on the inside.—W. B. H.

SZECHUAN. South Wushan, at 1500 to 2000 m., *Wilson*, 1046.

ANACARDIACEAE.

Rhus Wilsoni, *Hemsl.*; species modo *R. semialatae* foliorum rhachi inter foliola alata, ceterum omnino diversa, foliolis 5–8-jugis sessilibus pubescentibus oblongis vel lanceolato-oblongis rotundatis apiculatis; etiam *R. copallinae*, praesertim varietati e Florida (Curtiss, 5129), similis sed foliis molliter pubescentibus, alis latioribus et foliolis paucioribus apice rotundatis differt.—W. B. H.

Bush, 65 cm. to 1 m. high; branches pubescent. *Leaves* 11–17-foliolate, including petiole 12–20 cm. long, 7–10 cm. broad; petiole 2·5–4 cm. long; leaflets subsessile, rarely sessile, lanceolate-oblong or oblong, 4–6·5 cm. long, 1·5–2 cm. broad, rounded, apiculate, base cuneate, dark green above, grey beneath, pubescent on both surfaces; rhachis decurrent. *Panicles* small, 10 cm. long,

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dense, terminal and axillary in the upper leaves, thyrsoid; peduncles pilose. *Flowers* 3–5 mm. across, creamy-white, pedicellate, bracteate; pedicels 1–2 mm. long, hairy; bracts minute, scale-like. *Sepals* ovate, rounded, pubescent outside in basal half. *Petals* oblong, rather more than twice the length of sepals, rounded, base narrowed slightly; upper surface with prominent nerves, and bearded along the centre of lower half. *Stamens* rather more than half the length of petals; anthers large, yellow, *Disk* cup-shaped, slightly crenate, glabrous. *Styles* 3, free, shorter than stamens, angular; stigma simple; ovary pilose.—E. H. W.

WESTERN CHINA. Tung Valley, 600-900 m., rare, *Wilson*, 3370.

LEGUMINOSAE.

Ormosia Hosiei, *Hemsl. et E. H. Wils.*; inter species sinenses *O. striatae* affinis, differt foliis minoribus 5- vel 7-foliolatis, foliolis saepius supra medium latioribus, pedunculis brevioribus paucifloris, pedicellis longioribus, et legumine ovali recto compresso fere plano.—W. B. H.

Tree 9–15 m. high, bark grey and smooth. *Leaves* pinnately 5–7-foliolate, including petioles 12–20 cm. long; leaflets oblong or oblong-ovate, 5–12 cm. long; terminal leaflet ovate and larger, acuminate, cuneate at base, subcoriaceous, dark green above, paler and prominently reticulate below, glabrous when mature; petiolules 6–8 mm. long, slightly thickened, pubescent, or glabrescent and somewhat tuberculate. *Leaf-buds* naked, covered with a dense brown velvety indumentum. *Flowers* few in terminal or axillary shortly stalked panicles; pedicels 1·5–2 cm. long. *Calyx* cupulate; sepals short, orbicular. *Ovary* yellowish-green, erect, 5–6-ovuled. *Legume* brown, woody, oblong, 4–6·5 cm. long, 2·5–3 cm. broad, laterally compressed, beaked. *Seeds* 1–2, bright red, 1·5–2 cm. long, flattened laterally.

CENTRAL CHINA. Changyang, rare, *Wilson*, 1994.

W. CHINA. Chentu, 500 m., *Wilson*, 3407.

This is the Hung-tao shu (Red bean tree) of the Chinese. A large umbrageous tree, rather scarce, with valuable, heavy, rich red-coloured wood, beautifully marked, and in great demand for making better class furniture, and for carving and other purposes. A short account of this tree is given in Hosie's Report on the Province of Ssu-chuan (Cd. 2247), p. 55. No. 3047 was collected from the identical tree mentioned in the report. The specimen from Central China has rather more membranous leaves than that from Chentu. Both are in fruit.

This species is named in compliment to Alex. Hosie, Esq., of H.B.M. Consular Service, China, to whom we are indebted for much information respecting Chinese economic products.—E. H. W.

Ormosia Henryi, *Hemsl. et E. H. Wils.*; species distincta foliolis 5–9 breviter petiolulatis patentissimis subtus albo-tomentosis, legumine crasso maximo 11 cm. longo 10-spermo inter semina spongioso-septato.—W. B. H.

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Tree 6–9 m. high. *Leaves* pinnately 5–9-foliolate, including petioles 12–28 cm. long; leaflets elliptic or oblanceolate, 7–12 cm. long, 2–5·5 cm. broad, very shortly petiolulate, acute, margins slightly revolute, coriaceous, glabrous above, lower surface, rhachis and young shoots covered with short brownish-white velvety indumentum, as are also the peduncles, pedicels and calyx. *Flowers* in large much branched terminal or axillary panicles; pedicels 1–1·5 cm. long, bracteolate; bracteoles minute, scale-like. *Calyx* large, pubescent; sepals obovate, acute. *Legumes* 7–11 cm. long, 2–3 cm. wide, bluish-black, flattened, slightly beaked, 8–10-seeded. *Seeds* oval 8–15 mm. long, separated one from another by corky ingrowths from the walls of the pod.

KWANTUNG. *Ford*, 60.

CHEKIANG. *Hichen.*

HUPEH. Tree 6 m., smooth bark, wood bright yellow, *Henry*, 7577; Patung, tree 9 m., *Wilson*, 2587.

A very distinct tree not closely related to any known species. The four specimens in the Kew Herbarium are all in ripe fruit, and though collected in widely separated districts are absolutely identical.—E. H. W.

ROSACEAE.

Rosa multibracteata, *Hemsl. et E. H. Wils.*; species *R. Webbianae* similis, differt imprimis floribus saepius confertis pedunculis pedicellisque bracteis numerosis lanceolatis instructis, carpellis paucioribus et stylis longiorbus.—W. B. H.

Bush 2 m. high; primary branches erect, lateral branches spreading, glabrous, reddish, somewhat glaucescent; prickles on main shoots numerous, on secondary shoots in infrastipular pairs, yellowish, straight, sharp, 8–12 mm. long, base slightly dilated. *Leaves* shortly petiolate, 3–9-foliolate, including petioles 2–5 cm. long, 2–2·5 cm. broad; petiole 8–16 mm. long; leaflets shortly petiolulate, obovate, rarely oblong-obovate, 6–16 mm. long, 6–12 mm. broad, rounded, toothed, entire towards the cuneate base, dark green and glabrous above, pale green below with prominent silky-pubescent veins; rhachis with few prickles, and numerous short stipitate glands. *Stipules* adnate, rather over 1 cm. long, glandular-ciliolate; wings broad, free ends ovate or oblong-ovate, 4–6 mm. long, obtuse or acute. *Flowers* pink, 2·5–3 cm. across, in narrow terminal thyrsoid panicles; bracts very numerous, crowded, somewhat imbricate, tips recurved, lanceolate-ovate, 8–12 mm. long, shortly acuminate, remotely toothed in apical half, glandular-ciliolate; pedicels 0·5–2 cm. long, stipitate-glandular. *Calyx-tube* ellipsoid, 3–4 mm. long, stipitate-glandular; lobes ovate, rather over 1 cm. long, caudate-acuminate, slightly foliaceous, sparsely pubescent and clothed with many stipitate glands outside, very pubescent within. *Petals* orbicular, about 1·5 cm. in diameter, deeply emarginate. *Styles* about 12, long exserted, slender, pilose. *Fruit* globose, 6–8 mm. long, red, with few stipitate glands, crowned by erect persistent calyx-lobes. *Carpels* with apical tuft of yellowish setose hairs.

SZECHUAN. Min Valley, 2100 m., *Wilson*, 3531.

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A singular species having a multitude of bracts crowded around the flowers. It is one of the constituents of the flora of the warm, dry Min Valley, between Mao-chou and Sungpan.—E. H. W.

Rosa (§ **Cinnamomeae**) **setipoda**, *Hemsl. et E. H. Wils.*; species inter affines inflorescentia maxima laxa, bracteis foliaceis et pedicellis setis longis patentissimis capitato-glandulosis instructis distincta.—W. B. H.

Bush 2-3 m. high; branches glabrous; prickles few, scattered, straight, dilated at base, or very short, blunt, and broadly dilated. *Leaves* shortly petiolate, 7–9-foliolate, including petioles 12–18 cm. long, 6–10 cm. broad; leaflets shortly petiolulate, elliptic or ovate, 4–6·5 cm. long, 2–3 cm. broad, rounded or acute, base often slightly oblique, deeply serrate, rarely biserrate, dark green, glabrous above; underside greyish green, glabrous, or clothed with short setiform glands, veins prominent, mid-rib more or less clothed with appressed silky hairs; petiolules glabrous or pubescent; leaf rhachis channelled above, with few scattered subulate prickles below, glabrescent, with few or many short setiform glands. *Stipules* adnate, 2–2·5 cm. long, entire, glabrous and prominently veined above; setosely glandular below; wings broad; free ends triangular, rather over 1 cm. long, 3–4 mm. broad, very acute. *Flowers* rose-pink, 4–6·5 cm. across, bracteate, borne in flat lax terminal corymbs 15–25 cm. across; bracts and bracteoles leafy, persistent, ovate, 1·5–2 cm. long, 8–10 mm. broad, acute, base cuneate, glandular-ciliolate; pedicels 2·5–4·5 cm. long, erect, clothed with spreading setose glandular hairs. *Calyx-tube* narrowly ovoid, constricted above, purplish, with few or many setose, glandular hairs; lobes ovate, 2·5–3 cm. long, caudate-acuminate, reflexed, apex foliaceous, toothed, glabrous or setosely glandular outside, densely pubescent within. *Petals* broadly-obovate or orbicular, 2–2·5 cm. broad, rounded emarginate, sparsely pubescent. *Styles* 12–20, shortly exserted, thickened upwards, more or less trigonous, pilose. *Fruit* red, ovoid, 2·5 cm. long, constricted above, crowned with the erect persistent calyx-lobes. *Carpels* 6 mm. long, glabrous.

HUPEH. Fang District at 2100–2400 m., *Wilson*, 2409*a*.

A remarkable rose, allied to *R. macrophylla*, with large corymbs of handsome flowers. Its long pedicels clothed with spreading gland-tipped bristles and numerous foliaceous bracts give it a singular appearance. The species is not uncommon in shrubberies in the Mts. of North-West Hupeh.—E. H. W.

Rosa (§ **Systylae**) **Sinowilsoni**, *Hemsl.*; species *R. moschatae* proxima, a qua differt omnibus partibus majoribus, ramis pedicellisque ruberrimis fere nudis, foliolis anguste ovato-oblongis usque ad 12 cm. longis, corymbis laxissimis, pedicellis elongatis, petalis fere orbicularibus basi cuneatis extus pubescentibus et fructu ellipsoideo.—W. B. H.

A rambling bush, 6 m. high; branches glabrous, reddish when young; prickles very sparse, short, hooked, dilated at base. *Leaves* 5- or 7-foliolate, including petioles 15–28 cm. long; leaflets shortly petiolulate, oblong or elliptic, 7–12 cm. long, 3–5 cm. broad, long acuminate, base rounded or obliquæ, sharply serrate

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or biserrate, almost coriaceous, dark green, glabrous, somewhat rugose, pubescent; principal veins channelled above, very prominent below; petiole 5–10 cm. long, as well as the rhachis thick, reddish, glabrescent, channelled above, with several remote hooked prickles below; petiolules 2 mm. long, pubescent. *Stipules* adnate, 2–2·5 cm. long, free ends triangular, 4–6 mm. long, acuminate, serrate, pilose. *Flowers* white, 3–5·5 cm. across, erect, in large lax terminal corymbs, 20–25 cm. across; bracts oblong, acuminate, very deciduous; pedicels 2·5–5 cm. long, stout, reddish, glabrous, save for a few scattered stipitate glands. *Calyx-tube* ovoid, glabrous; lobes spreading, ovate, caudate, 2–2·5 cm. long, laciniate or entire, glabrous or pubescent outside, pubescent inside; laciniae remotely-toothed. *Petals* broadly obovate, 2–2·5 cm. long, 1·5–2 cm. broad, entire, rounded, base cuneate, pubescent outside. *Style* exserted rather over 1 cm., pilose; stigma clavate. *Fruit* ellipsoid, about 1·5 cm. long, red; calyx-lobes deciduous; style partially persistent.

SZECHUAN. Mt. Omi and mountains to the south, at 450–1200 m., *Wilson*, 4875, 3537*a*.

A very striking and distinct rose with large leaves, red petioles, peduncles and pedicels, very large lax corymbs and remarkably long pedicels. Though obviously allied to *R. moschata* it is very different from this and indeed from any other species.—E. H. W.

Rosa Moyesii, *Hemsl. et E. H. Wils.*; species *R. macrophyllae* proxima, a qua foliis patentibus aculeatis, foliolis creberrime denticulatis, floribus solitariis atropurpureis et fructu maximo cum calycis lobis erectis 6 cm. longo apice constricto differt.—W. B. H.

An erect bush, 2·5–3·5 m. high; branches glabrous with very few prickles; prickles short, straight, dilated at base. *Leaves* 7–13-foliolate, including the petioles 8–18 cm. long, 4–7·5 cm. broad; petioles 2–2·5 cm. long; leaflets subsessile, elliptic, rarely elliptic-lanceolate, 1·5–4 cm. long, 6–25 mm. broad, abruptly acute, regularly dentate-serrate, glabrous save midrib, which on under side is clothed with silky appressed hairs; rhachis pilose, with few or several straight subulate prickles, and numerous setose glands. *Stipules* adnate, 1·5–2 cm. long, purplish, wing broad, free ends deltoid, glandular-ciliolate. *Flowers* erect, solitary at the ends of short lateral shoots, very dark red, 5–6·5 cm. across, bracteate; bracts 1–2, oblong, acute, ciliolately glandular; peduncles 2–3 cm. long, naked or clothed with setose glands. *Calyx-tube* ovoid, naked or setosely glandular, purple; lobes spreading, oblong-ovate, 2–2·5 cm. long, caudate-acuminate, slightly foliaceous at apex, sparsely pubescent, often with few setose glands outside, very pubescent inside. *Petals* orbicular, 2–3 cm. broad, rounded, occasionally somewhat cuneate at base, slightly hairy outside. *Styles* 8, exserted, shorter than stamens, thickened upwards, more or less trigonous, pilose. *Fruit* red, ovoid, 3 cm. long, constricted above, and crowned by the persistent calyx-lobes which have become erect and enclose the stamens.

SZECHUAN. Tibetan frontier, chiefly near Tatien-lu, 2700–4000 m., *Pratt*, 172; 2100–2700 m., *Wilson*, 3543.

This species is not uncommon in shrubberies on the mountains between Mt. Omi and Tatien-lu, and its dark-red flowers are

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singularly pleasing. Named in compliment to the Rev. J. Moyes, of the China Inland Mission, stationed at Tatien-lu, to whom I am much indebted for hospitality, assistance, and companionship on one long and interesting journey in Eastern Tibet.—E. H. W.

Rubiaceae

Randia acutidens, *Hemsl. et E. H. Wils.*; ab *R. densiflora* arcte affini differt imprimis cymis paucifloris et calycis limbo distincte lobulato lobulis acutissimis. *Diplospora* sp.? Hemsl. in Journ. Linn. Soc., vol. xxiii., p. 384.—W. B. H.

Bush or small tree 3 m. high. *Leaves* oblong-lanceolate, shortly petiolate, including petioles 10–15 cm. long, 2·5–5 cm. broad, acuminate, base cuneate, glabrous, coriaceous, dark-green above, brownish or pallid beneath; veins prominent on both surfaces; petioles 6–8 mm. long. *Stipules* triangular, acuminate, about 1 cm. long, deciduous. *Cymes* sessile, or subsessile, on leafless nodes, branched from the base; branches divaricate. *Flowers* 10–18, white, about 2·5 cm. across, pedicellate, bracteate; pedicels 3–6 mm. long; bracts small, scale like, acute. *Calyx* short, cupulate, toothed; teeth triangular, very acute. *Corolla-tube* 4 mm. long, cylindrical, glabrous outside, throat closed by a ring of silky hairs; lobes folded back, a little longer than the tube, ovate and bluntly acute, or oblong-ovate, mucronate. *Stamens* subsessile; anthers exserted, reflexed, nearly as long as corolla-lobes. *Style* straight, stout, exserted about 1 cm.; ovary glabrous. *Berry* globular, the size of a small pea, black, many-seeded. *Seeds* ovoid.—E. H. W.

Szechuan. *Henry*, 8924; *Pratt*, 377; hills around Kiating, *Wilson*, 4093, 4423.

Campanulaceae.

Pentaphragma sinense, *Hemsl. et E. H. Wils.*; *P. begoniifolio* proximum, differt habitu, foliis minus inaequilateralibus integris, floribus majoribus et sepalis petala aequantibus.—W. B. H.

Herb with short horizontal stem. *Leaves* obliquely-ovate, including petiole 12–22 cm. long, 7–10 cm. broad, entire, obtuse, base cuneate, or excised on one side, dark-green, glabrous above, pale, scabrid-puberulous below; petioles 4–5 cm. long, fleshy, scabrid. *Flowers* white, 8 mm. broad, erect in lateral scorpioid cymes 5–7·5 cm. long; peduncles 2–3 cm. long, stellately-pubescent; bracts obovate, 8–10 mm. long, 4 mm. broad, rounded, stellately-puberulous; pedicels 2 mm. long. *Calyx-tube* very short; lobes suberect, oblong-obovate, 7–8 mm. long, rounded, stellately hairy, persistent. *Corolla* campanulate, 8–10 mm. long, deeply 5-lobed; lobes erect, oblong-ovate, persistent; apices inflexed, apiculate, bearded. *Stamens* half length of corolla; filaments flattened; anthers linear-oblong, apiculate. *Style* short, thick; stigma peltate, obscurely-lobed; ovary 8–10 mm. long, campanulate, ribbed, stellately puberulous; ribs narrowly winged.

Chino-Tonking Frontier. Laokai, moist shady banks of ravines, August, 1899, *Wilson*, 2787.

The flowers of this plant are exceedingly mucilaginous.—E. H. W.

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PRIMULACEAE.

Lysimachia Wilsoni, *Hemsl.*; habitu et adspectu *L. ramosae* simillima, ab ea tamen pedunculis saepissime plurifloris, floribus fere duplo majoribus et calycis lobis fere orbicularibus abrupte acuminatis differt.—W. B. H.

Herb 30–45 cm. high, erect, glabrous, branching only from the very base. *Stems* angular, winged. *Leaves* alternate, elliptic to elliptic-lanceolate, including the petiole 9-14 cm. long, 2·5–5 cm. broad, acuminate, entire or very obscurely toothed, membranous; veins prominent; petioles 2–3 cm. long, winged. *Flowers* yellow, 1·5–2·5 cm. across, erect, in lax axillary racemes, or in axils of uppermost leaves solitary; peduncles suberect, 2–4 cm. long, angular, 3–5-flowered; bracts leafy, ovate, 8–12 mm. long, acuminate; pedicels filiform, spreading, 2–3 cm. long. *Sepals* nearly orbicular, 2–4 mm. long, acuminate. *Corolla* rotate; lobes spreading, oblong-elliptic, 8–12 mm. long. *Filaments* exceedingly short, united at base, forming a cup-shaped disk around ovary; anthers 4 mm. long, conniving, auricled. *Pistil* 6–8 mm. long, exceeding the stamens; style subulate; stigma simple.

SZECHUAN. Mt. Omi, rare, *Wilson*, 5061.

This is possibly the same as Franchet's *L. ramosa*. var. *grandiflora*, in Journ. de Bot. ix. (1895), p. 464—a plant collected in Yunnan by Père Delavay. If this is so the varietal name cannot stand in view of *L. grandiflora*, Nuttall.—E. H. W.

STYRACACEAE.

Symplocos Wilsoni, *Hemsl.*; ut videtur ex affinitate *S. stellatae* (species mihi ignotae) a qua foliis utrinque cuneatis, fasciculis multifloris, petalis supra medium ciliolatis et staminibus quam petalis dimidio longioribus differt.—W. B. H.

Tree 7 m. high, evergreen; younger branches densely clothed with short reddish-brown indumentum. *Leaves* oblong-lanceolate, including petiole 10–12 cm. long, 2–2·5 cm. broad, acute, base cuneate, margins revolute, glabrous, coriaceous, shining above, paler below; lateral nerves alternate, distant, prominent on upper surface, obscure on underside; petioles angular, rather over 1 cm. long, rusty-pubescent when young. *Flowers* about 1 cm. across, greenish-yellow, in nearly sessile clusters in the axils of fallen leaves on previous year's shoots; pedicels very short, pilose; bracteoles 3, imbricate, broadly-obovate or orbicular, 2 mm. long, ciliate, sparsely pilose. *Calyx* 1 mm. long, cup-shaped; lobes rounded, ciliate. *Petals* free, imbricate, erect, oblong-ovate or obovate, 6–8 mm. long, rounded, ciliolate, concave. *Stamens* about 20, slightly exceeding the petals; filaments flattened. *Disk* annular. *Pistil* a little longer than stamens; style persistent, at least for a considerable time; ovary glabrous.—E. H. W.

SZECHUAN. Woods at 1200–1800 m., *Wilson*, 4067.

Styrax Veitchiorum, *Hemsl. et E. H. Wils.*; species ex affinitate *S. Hemsleyanae* et *S. odoratissimae*, a priore differt foliis lanceolatis calycis dentibus minutis, et staminibus petala aequantibus, a posteriore floribus in ramis lateralibus numerosissimis,

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calyce parvo crasso densissime albo-tomentoso denticulato (non truncato fisso) et filamentis quam antheris longioribus recedit.—W. B. H.

Small tree 4–5 m. high; young branches stellately pubescent. *Leaves* lanceolate-ovate, including the petioles 7–11 cm. long, 2·5–4·5 cm. broad, acuminate, base rounded or cuneate, remotely toothed, membranous, venation prominent on underside with tufts of stellate hairs in the axils of principal veins. *Flowers* white, 2–2·5 cm. across, in axillary and terminal cymes, either racemose or fascicled, on lateral branches 7–20 cm. long, of the current year's growth; the whole shoot forming a narrow leafy panicle; peduncles 3–10-flowered, stellately pubescent; pedicels slender, rather over 1 cm. long, pubescent. *Calyx* cup-shaped, 2–3 mm. long, minutely 5-toothed, with short white dense stellate pubescence on both surfaces. *Corolla-tube* 2 mm. long; lobes spreading, 8–10 mm. long, ovate or elliptic-ovate, obtuse or subacute, pubescent. *Stamens* as long as corolla-lobes; filaments flattened, pilose; anthers 4–5 mm. long. *Pistil* equalling the stamens in length, tomentose.—E. H. W.

HUPEH. Fang district, forest at 2100–2400 m., only once seen, *Wilson*, 2015.

Styrax confusa, *Hemsl.*; species distincta, olim (Journ. Linn. Soc., vol. xxvi., p. 77) cum *S. odoratissima* fallaciter juncta, a qua foliis coriaceis breviter petiolatis, floribus saepius in paniculas parvas terminales dispositis, calyce denticulato, petalis crassis intus nudis, filamentis brevibus barbatis et stylo fere glabro differt.

KWANTUNG. Lantao Island, Mr. Ford's native collector, **May**, 1888.

Alniphyllum megaphyllum, *Hemsl. et E. H. Wils.*; ab *A. pterospermo* foliis majoribus usque ad 20 cm. longis et 10 cm. latis, pilis stellatis brevioribus, pedicellis subcapsulis abrupte deflexis et seminum alis latioribus recedit.—W. B. H.

Tree 6 m. high. *Leaves* broadly ovate, rarely obovate, including the petioles 15–20 cm. long, 6–10 cm. broad, shortly acuminate regularly or remotely serrate, dark green and sparsely stellately hairy above, pale green or glaucous and clothed with short stellate hairs beneath; petiole 1–1·5 cm. long. *Panicles* narrow, axillary, 15 cm. long, borne on preceding year's growth; pedicels 8–10 mm. long, sharply deflexed towards axis. *Capsule* dark brown, somewhat pentagonal, oblong, rather under 2 cm. long, beaked, with few short stellate hairs. *Seeds* 7–10 mm. long.

HUPEH. Changyang at 1500–2100 m., *Wilson*, 2686, 2685.

An interesting addition to this recently-established genus. Unfortunately both specimens are in ripe fruit, and the flowers are unknown. The tree is rare, and was only met with in the forest to the south-west of Ichang.—E. H. W.

APOCYNACEAE.

Vallaris grandiflora, *Hemsl. et E. H. Wils.*; *V. Heynei* proxima, a qua foliis supra medium latioribus, cymis subtrifloris, floribus fere triplo majoribus et corollis intus albo-pilosis differt.—W. B. H.

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Twining shrub with pale grey bark. *Leaves* ovate or obovate, including petiole 8–11 cm. long, 4–5 cm. broad, acuminate, nearly glabrous above, pubescent below; petioles 4–8 mm. long. *Flowers* in shortly pedunculate axillary fascicles of 3, pale yellow, 4 cm. across, pedicellate; pedicels 1–1·5 cm. long, pubescent. *Sepals* oblong-ovate, rather over 1·5 cm. long, acute, pubescent. *Corolla-tube* 8 mm. long, glabrous outside; limb spreading, pubescent, lobed rounded, apiculate. *Anthers* exserted; filaments short, pilose. *Pistil* over 1 cm. long; ovary and style pilose; stigma oblique. *Disk* green, cup-shaped, ciliate toothed.

SZECHUEN. Tung Valley, at about 700 m., *Wilson*, 4108.

A showy climber with flowers much larger than in other members of the genus. It is rather rare, being met with only in the dry warm valley of the Tung river.—E. H. W.

SALICACEAE.

Salix magnifica, *Hemsl.*; species distinctissima undique glaberrima, foliis maximis cum petiolo pollicari circiter 22·5 cm. longis et 15 cm. latis, amentis masculis absque pedunculo brevi usque ad 10 cm. longis, femineis 20 cm. longis, florum masculorum glandula antica magna carnosa 2- vel 3-lobata.

A shrub about two metres high, glabrous in all parts. *Branches* straight, dark purple in the dried state, and sparingly lenticellate. *Leaves* almost coriaceous when mature, pale below, those of the sterile branches elliptical or obovate, the largest, including the petiole, about 22·5 cm. long by 15 cm. broad, abruptly and obtusely acuminate, rounded at the base; primary veins 12 to 15 on each side of the midrib, slightly curved; those on flowering branches relatively small, crowded, obovate or oblong, smaller downwards and lowermost scale-like. *Male catkins* shortly stalked, including stalk 10 to 12 cm. long, horizontal or ascending. *Flowers* diandrous. *Female catkins* 20 cm. long, apparently erect. *Capsule* two-valved, valves recurved.

WESTERN SZECHUAN. Mountains, at about 2700 m., *Wilson*, 4526.

A very remarkable species, having large, broad leaves, more like those of a poplar than of a willow, and very long catkins. Only two plants were seen by Mr. Wilson.—W. B. H.

XXVI.—DIAGNOSES AFRICANAE: XVII.

841. **Helichrysum argyrocephalum**, *C. H. Wright* [Compositae-Inuloideae]; ex affinitate *H. Guilelmi*, Engl., et *H. Volkensii*, O. Hoffm., differt foliis basi auriculatis, indumento non arachnoideo.

Caulis fruticosus, teres, viscide pubescens. *Folia* anguste lanceolato-acuminata, acuta, 5 cm. longa, 4 mm. lata, integra, utrinque hirsuta, basi late auriculata (1 cm. lata); costa supra impressa, subtus prominens. *Capitula* corymbose disposita,

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2 cm. diam.; bracteae argenteo-nitidae, lanceolatae, 8 mm. longae, 2 mm. latae, acutae, paleaceae, obscure serratae. *Flores* 3 mm. longi.

TROPICAL AFRICA. Uganda Protectorate: Nandi, 1800–2400 m., *Johnston*.

842. **Helichrysum retortoides**, *N. E. Brown* [Compositae-Inuloideae]; affine *H. retorto*, Thunb., sed ramis brevioribus erectis confertis, foliis angustioribus confertioribus, capitulis minoribus et indumento differt.

Planta 7–10 cm. alta. *Rami* erecti, conferti, simplices vel superne parce ramosi, lignosi, graciles, usque ad apices dense foliosi. *Folia* 5–8 mm. longa, 1·5–2 mm. lata, lineari-oblonga, obtusa, supra indumento argenteo-coactili vestita vel subglabra, subtus dense albo-tomentosa. *Capitula* solitaria, sessilia, 2–2·5 cm. longa, cylindrica. *Involucri* squamae pluriseriatae, glabrae; exteriores ovatae vel lanceolatae, subacutae, rubrae; interiores longiores, lineari-lanceolatae, obtusae, albae. *Flores* lutei, involucro duplo breviores. *Corolla* 7 mm. longa, filiformi-tubulosa, brevissime 5-dentata. *Ovarium* minutissime papillatum. *Pappi* setae apice breviter barbellatae.

NATAL. On the slopes of the Drakensberg, 1800–2100 m., *Wilson in Herb. Wood*, 8265.

843. **Aspilia vulgaris**, *N. E. Brown* [Compositae-Helianthoideae]; affinis *A. zombensi*, Baker, sed foliis minoribus, involucri bracteis latioribus, floribus luteis nec aurantiacis differt.

Herba perennis, 30–60 cm. alta. *Caules* erecti, ramosi, scabrido-pubescentes. *Folia* opposita, brevissime petiolata, 1·5–4·5 cm. longa, 1–2·5 cm. lata, ovata, acuta, basi late rotundata vel subcordata, acute serrata, utrinque scabrida. *Pedunculi* 1·5–4 cm. longi (vel ultra?), scabrido-pubescentes. *Involucri* bracteae 3-seriatae, 5–7 mm. longae, 2 mm. latae, lineari-oblongae, acutae, scabridae. *Squamae* receptaculi rigidae, convolutae, acutissime acuminatae, glabrae. *Corolla* radii 1–1·5 cm. longa, 4–6 mm. lata, lutea, subtus minutissime glanduloso-puberula; disci 5 mm. longa, tubulosa, 5-dentata, glabra, lutea. *Ovarium* radii glabrum, disci pubescens, pappo cupulari lacerato-fimbriato coronatum.

RHODESIA. Mashonaland: very common between Umtali and Salisbury, *Hon. Mrs. Evelyn Cecil*, 43.

844. **Lobelia Johnstoni**, *C. H. Wright* [Campanulaceae-Lobelieae]; ex affinitate *L. coronopifoliae*, L., differt corollae loborum circumscriptione coloreque.

Caulis 3 mm. diam., suffruticosus, plus minusve decumbens; rami erecti, virgati, glabri. *Folia* oblanceolata vel fere linearia, obtusa, parce irregulariterque dentata, glabra, 1·5 cm. longa, 2 mm. lata. *Racemi* pauciflori; bracteae parvae, subulatae; pedicelli demum 8·5 cm. longi, appresse strigosi. *Calycis* tubus turbinatus, basi acutus, extus appresse strigosus; lobi 2·5 mm. longi, lineari-lanceolati, acuti, ciliati. *Corolla* roseo-purpurea; tubus 7 mm. longus; lobi superiores lanceolato-falcati, acuti, laterales ovati, obtusi, infimus caeteris longior, obtriangularis. *Stamina* 8 mm.

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longa; filamenta plana, costa conspicua; antherae omnes pluma brevi alba terminatae. *Stylus* staminibus paullo brevior. *Semina* 1 mm. longa, ovoidea, trigona.

TROPICAL AFRICA. Uganda Protectorate: Nandi Plateau, *Johnston*.

845. **Cyphia alba**, *N. E. Brown* [Campanulaceae-Cyphieae]; affinis *C. persicifoliae*, Presl., sed floribus multo minoribus facile distinguitur.

Caulis erectus, tortuosus (vel subscandens ?), 2 mm. crassus, glaber, supra medium aphyllus. *Folia* pauca, alterna, patentia, sessilia, 7·5-9·5 cm. longa, 4–6 mm. lata, linearia, acuta, serrulata, complicata, glabra. *Racemus* terminalis, 4·5 cm. longus, longissime pedunculatus, pluriflorus, spiraliter tortus. *Bracteae* 4–6 mm. longae, lineares, acutae, denticulatae. *Bracteolae* 3 mm. longae, lineares, acutae. *Pedicelli* 2–3 mm. longi, puberuli. *Calyx* 5-lobus; tubus late obconicus, 1·5 mm. longus, dense puberulus; lobi 2·5–3 mm. longi, lineares, acuti, patulo-erecti, dorso tenuiter puberuli. *Corolla* parva, alba; petala 5–6 mm. longa, 1·5–2 mm. lata, spathulato-ovata, acuta. *Antherae* oblongae, apice minute barbatae.

BRITISH CENTRAL AFRICA. Rhodesia: Manika district, north of Umtali, *Evelyn Cecil*, 163.

846. **Wahlenbergia mashonica**, *N. E. Brown* [Campanulaceae-Campanuleae]; affinis *W. Ecklonii*, Buek, sed floribus minoribus et sepalis quam tubo corollae multo brevioribus differt.

Herba 15–25 cm. alta, omnino glabra. *Caules* graciles, superne laxe corymboso-ramosi. *Folia* parva, 3–7 mm. longa, 0·5–0·7 mm. lata, linearia, acuta, marginata, minute denticulata. *Flores* sparsi, parvi. *Pedicelli* 6–10 mm. longi, subcapillares. *Calyx* 5-lobus; tubus late obconicus, 1 mm. longus, demum 1·5 mm. longus; lobi 1·5 mm. longi, distantes, subulati, acuti, erecti. *Corolla* campanulata, 5-loba, caerulea; tubus 3 mm. longus, 2·5 mm. diam.; lobi 2 mm. longi, ovati, acuti. *Capsula* semisupera vel fere supera, 3-valvis, 2·5 mm. longa.

RHODESIA. Mashonaland: between Salisbury and Headlands, *Hon. Mrs. Evelyn Cecil*, 157.

847. **Carissa Wyliei**, *N. E. Brown* [Apocynaceae-Carisseae]; affinis *C. grandiflorae*, A. DC., sed habitu graciliore, foliis tenuioribus et lobis corollae acutis differt.

Frutex dichotome ramosus, ubique corollae tubo excepto glaber. *Rami* graciles, 1·5–3 mm. crassi; spinae brevissimae vel nullae, simplices vel furcatae, 1–2 mm. longae. *Folia* breviter petiolata, 5–8 cm. longa, 2·5–4·5 cm. lata, ovata vel lanceolata, acutissima, basi cuneata vel rotundata; petiolus 2–3 mm. longus. *Cymae* terminales, subsessiles, 5–6-florae. *Pedicelli* 4–6 mm. longi. *Sepala* 2·5–3 mm. longa, deltoideo-subulata, acutissima. *Corollae* tubus 1·2 cm. longus, 1·5 mm. diam., cylindricus, intra pubescens; lobi 1·2–1·5 cm. longi, 4 mm. lati, lanceolati, acuti, patentes.

NATAL. Zululand District: Ngoya, 300–600 m., *Wylie in Herb. Wood*, 7898.

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848. **Trichocaulon Alstoni,** *N. E. Brown* [Asclepiadaceae-Stapelieae]; affine *T. pilifero*, N. E. Brown, sed floribus campanulatis flavis et pedicellis longioribus differt.

Caulis 15 cm. altus, 4 cm. crassus vel ultra, multiangularis, glaber; anguli spinoso-tuberculati, spinis 6–10 mm. longis. *Flores* inter angulos caulis versus apicem fasciculati. *Bracteae* minutae, subulatae. *Pedicelli* 3–4 mm. longi, glabri. *Sepala* erecta, 3 mm. longa, 1·5 mm. lata, ovata, acuminata, glabra. *Corolla* campanulato-infundibuliformis, glabra, flava; tubus 4–5 mm. longus; lobi 4–5 mm. longi, ovati, peracuti. *Corona exterior* breviter cupularis, aequaliter 10-dentata, glabra; dentes deltoideo-oblongi, obtusi. *Coronae interioris* lobi oblongi, obtusi, antheris incumbentes.

CAPE COLONY. Little Namaqualand: in stony fields near Namies, 900 m., *Alston in MacOwan, Herb. Austr.-Afr.*, 2017.

849. **Ipomoea Cecilae,** *N. E. Brown* [Convolvulaceae-Convolvuleae]; affinis *I. commatophyllae*, A. Rich., sed lobis foliorum linearibus et floribus triplo majoribus differt.

Planta herbacea 45–60 cm. diam. *Rami* prostrati, pubescentes. *Folia* petiolata; petiolus 1–2 cm. longus, pubescens; lamina profunde et inaequaliter trifida, basi cuneato-acuta, utrinque leviter puberula; lobus intermedius 2–3 cm. longus, 4 mm. latus, linearis, acutus vel subobtusus; lobi laterales 0·5–2 cm. longi, 2–2·5 mm. lati, erecto-patentes, lineares, acuti. *Flores* axillares, solitarii. *Pedunculus* 1–2 cm. longus, medio bibracteatus, pubescens. *Bracteae* vix 1·5 cm. longae, erectae, filiformes, pubescentes. *Sepala* vix 1·5 cm. longa, 5–6 mm. lata, ovata, longe acuminata, erecta, puberula. *Corolla* purpureo-rosea, glabra; tubus 2·5 cm. longus, apice vix 1·5 cm. diam.; limbus 5 cm. diam. *Stigma* 2-globosum.

RHODESIA. Mashonaland: near Umtali, *Hon. Mrs. Evelyn Cecil*, 36.

850. **Dyschoriste matopensis,** *N. E. Brown* [Acanthaceae-Ruellieae]; affinis *D. Fischeri*, Lindau, sed foliis minutissime et tenuissime puberulis nec molliter pubescentibus, venis obscuris et floribus minoribus roseo-albis nec luteis differt.

Frutex parvus, ramosus, ubique minutissime puberulus, cortice cinereo. *Folia* opposita, parva, breviter petiolata, 6–12 mm. longa, 3–6 mm. lata, lanceolata, obovata vel anguste elliptica, obtusa, basi cuneata, subcoriacea, venis obscuris, utrinque parce et minutissime puberula. *Flores* axillares, solitarii, brevissime pedicellati, bibracteati. *Bracteae* 1–2 mm. longae, obovatae. *Calyx* tubulosus, 5-dentatus; tubus 6–7 mm. longus; dentes 3–4 mm. longi, subulati. *Corolla* subaequaliter 5-loba, roseo-alba; tubus 2 cm. longus, anguste cylindricus; lobi 5–6 mm. longi, 2·5 mm. lati. *Stamina* 4; antherae lineares, aequales.

RHODESIA. Matabeleland: Matopo Mountains, *Hon. Mrs. Evelyn Cecil*, 114.

851. **Orthosiphon dissimilis,** *N. E. Brown* [Labiatae-Ocimoideae]; affinis *O. Hildebrandtii*, Baker, sed foliis acutioribus et calycibus longioribus recedit.

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Herba erecta, 30–45 cm. alta. *Caulis* puberulus, 2 mm. crassus. *Folia* distantia, petiolata; petiolus 1–2 cm. longus; lamina 3–5 cm. longa, 2–3 cm. lata, ovata, acuta vel subacuta, dentata, basi cuneato-acuta, supra viridis, fere glabra, subtus subglauca. *Verticillastri* numerosi, distantes, 6–8-flori. *Bracteae* 2–4 mm. longae, obovatae, obtusae vel subapiculatae, reflexae. *Pedicelli* 3–6 mm. longi, puberuli. *Calyx* 5-dentatus, purpureus, parce pubescens; tubus 5 mm. demum 8 mm. longus, tubulosus, leviter curvatus; dens superior 2 mm. longus, orbicularis, obtusus; dentes laterales 1·5 mm. lati, deltoideo-subulati; inferiores 2·5–3 mm. longi, setiformes. *Corolla* pallide purpurea, puberula; tubus exsertus, vix 1 cm. longus, leviter curvatus; labium superius 3·5–4 mm. longum, subaequaliter 4-lobum; labium inferius 3–4 mm. longum, complicatum, obtusum. *Stamina* libera, 2 mm. longa, exserta.

PORTUGUESE EAST AFRICA. By the Railway between Beira and Massi Kessi, *Hon. Mrs. Evelyn Cecil*, 20.

852. **Plectranthus selukwensis**, *N. E. Brown* [Labiatae-Ocimoideae]; affinis *P. sphaerophyllo*, Baker, sed foliis basi subtruncatis et floribus minoribus differt.

Herba 23–30 cm. alta, ubique plus minusve puberula vel pubescens. *Folia* patentia; petiolus 1–3 cm. longus; lamina 1·5–2 cm. longa, 1·5–2·5 cm. lata, latissime deltoidea, acuta, grosse dentata, basi subtruncata. *Verticillastri* 4–6-flori, subdistantes. *Bracteae* minutae, late ovatae. *Pedicelli* 2 mm. longi. *Calyx* 2·5 mm. longus, ad medium 5-dentatus; dens superior ovatus, subobtusus; dentes inferiores deltoidei, acuti. *Corolla* vix ultra 1 cm. longa, caeruleo-purpurea, glanduloso-punctata; tubus medio abrupte subincumbente-reflexus; labium superius 5 mm. longum, breviter et obtuse 4-lobum; inferius 6 mm. longum, cymbiforme, obtusum, intra hirsutum.

RHODESIA. Matabeleland: common at Selukwe, *Hon. Mrs. Evelyn Cecil*, 123.

853. **Coleus scaposus**, *C. H. Wright* [Labiatae-Ocimoideae]; ad *C. Penzigii*, Schweinf., accedit; pedicellis elongatis, labio antico corollae apice incurvo tomentoque velutino differt.

Radix perennis, lignosus, 8 mm. crassus. *Folia* late oblanceolata, obtusa, 5 cm. longa, 2 cm. lata, basi in petiolum 1 cm. longum attenuata, crenata. *Inflorescentia* scaposa, indivisa; verticillastri ad 12-flori; bracteae ovatae, 2 mm. longae; pedicelli ad 1·5 cm. longi, rufo-velutini. *Calyx* 4 mm. longus, extus pilosus; segmentum posticum ovatum, reliqua subulata. *Corolla* 1·7 cm. longa, extus pubescens; labium anticum 1·2 cm. longum, naviculare, apice incurvum; posticum 5 mm. longum, rotundatum. *Filamenta* ad medium connata. *Nuculae* compressae.

BRITISH CENTRAL AFRICA. Nyasaland: Namasi, *Cameron*, 60.

854. **Walafrida Cecilae**, *Rolfe* [Selagineae]; affinis *W. paniculatae*, Rolfe, sed sepalis longioribus et angustioribus, corolla angustiore recedit.

Fruticulus ramosissimus, "30–60 cm. altus." *Rami* cinereo-puberuli. *Folia* saepissime fasciculata, lineari-oblonga, obtusa,

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integra, puberula vel hispidula, 2–4 mm. longa. *Capitula* multiflora, numerosissima, in paniculam laxam plus minusve elongatam disposita. *Bracteae* oblongae, obtusae, puberulae vel hispidulae, 1·5 mm. longae. *Calyx* bipartitus, 1 mm. longus; sepala oblonga, obtusa, minute ciliata, membranacea, oblique uninervia. *Corolla* "alba," 2 mm. longa, tubo oblongo, lobis inaequalibus orbicularibus. *Fructus* late orbiculari-ovoideus, 1 mm. longus.

RHODESIA. Near Bulawayo, *Hon. Mrs. Evelyn Cecil.*

This has the habit and general appearance of the S. African *Walafrida paniculata*, Rolfe (*Selago paniculata*, Thunb.), but is markedly different in the details of the minute flowers.

855. **Loranthus Cecilae**, *N. E. Brown* [Loranthaceae-Eulorantheae]; affinis *L. Molleri*, Engl., sed foliis minoribus cordatis obtusis glaucis differt.

Rami pubescentes. *Folia* opposita, petiolata; petiolus 3–6 mm. longus, pubescens; lamina 1·5–3·5 cm. longa, 1·5–2·5 cm. lata, cordato-ovata, obtusa, utrinque glabra, glauca. *Cymae* subsessiles, axillares, 4–7-florae. *Pedicelli* 2 mm. longi, puberuli. *Bractea* oblique cupuliformis, acuta, puberula. *Calycis* puberuli limbus brevissimus, cupuliformis, truncatus. *Corolla* 3–3·5 cm. longa, viridi-lutea, apice coccinea, pubescens, recta, supra basin pentagono-globosam constricta, ultra medium lateraliter fissa, apice 5-loba; lobi anguste lineari-lanceolati, acuti. *Stamina* 5; filamenta 6 mm. longa, linearia, apice in dentem brevem producta, glabra; antherae 2 mm. longae. *Stylus* gracilis, prope apicem leviter fusiformi-incrassatus, pentagonus; stigma subglobosum.

RHODESIA. Matabeleland: near Bulawayo Waterworks, *Hon. Mrs. Evelyn Cecil*, 96.

856. **Loranthus virescens**, *N. E. Brown* [Loranthaceae-Eulorantheae]; affinis *L. Dregei*, Eckl. et Zeyh., sed foliis bracteis et indumento differt.

Rami novelli dense stellato-tomentosi. *Folia* opposita, stellato-tomentosa; petiolus 4–6 mm. longus; lamina 2·5–4·5 cm. longa, 1·5–2·5 cm. lata, elliptica vel elliptico-ovata, obtusissima, basi rotundata. *Cymae* axillares, longe pedunculatae, 4-florae. *Pedunculus* 1·5–2·5 cm. longus, stellato-tomentosus. *Pedicelli* 1–2 mm. longi, stellato-tomentosi. *Bractea* 5 mm. longa, 2 mm. lata, lineari-lanceolata, obtusa, supra glabra, subtus stellato-tomentosa. *Calyx* 2·5 mm. longus, appresse tomentosus; limbus subnullus. *Corolla* 5 cm. longa, ad ⅔ in lobos 5 lineares acutos divisa, virescens, extra pilis minutis stellatis cum pilis longis intermixtis dense obtecta; tubus 1·7 cm. longus, basi ovoideo-inflatus; lobi 3·5 cm. longi, prope apicem 1·5 mm. lati. *Stamina* 5, glabra; filamenta 2 cm. longa, filiformia, apice edentata; antherae 8 mm. longae, lineares, acutae, cum filamento continuae. *Stylus* gracilis; stigma leviter clavatum.

RHODESIA. Mashonaland: Six-mile Spruit near Salisbury, *Hon. Mrs. Evelyn Cecil*, 147.

857. **Schizochilus Cecili**, *Rolfe* [Orchidaceae-Ophrydeae]; facies fere *S. Bulbinellae*, differt labello valide trilobo basi tricalloso.

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Folia subradicalia, circa 5, lanceolato-oblonga, acuta, 5–7·5 cm. longa, subconduplicata, 1–2 cm. lata. *Scapus* circa 25 cm. altus, apice vaginis lanceolatis obtectus; spica cylindrica, multiflora; bracteae ovato-lanceolatae, acuminatae, 4–6 mm. latae; pedicelli 3 mm. longi. *Sepala* late ovata, subobtusa, 2·5 mm. longa. *Petala* late ovata, subobtusa, 1-nervia, 1·5 mm. longa. *Labellum* 2·5 mm. longum, 2 mm. latum, trilobum, trinervium, basi tricallosum, lobis lateralibus brevilus latis subobtusis, lobo intermedio late triangulari-ovato subobtuso, callis oblongis carnosis obtusis. *Columna* brevissima.

RHODESIA. Manika: Inyanga Mountains, 1800–2100 m., *E. Cecil*, 202.

An interesting member of a small genus which has hitherto only been known from extra-tropical South Africa. The flowers are noted as bright yellow.

858. **Kaempferia Cecilae**, *N. E. Brown* [Scitamineae-Zingibereae]; affinis *K. roseae*, Schweinf., sed foliis anguste lineari-lanceolatis facile distinguitur.

Folia erecta, anguste lineari-lanceolata, acutissima, basi acuta, glabra; petiolus 7·5–10 cm. longus; lamina 25–35 cm. longa, 2·5–3 cm. lata. *Racemi* 15–25 cm. longi, angusti, pluriflori, ubique glabri. *Bracteae* 2–2·5 cm. longae, vel infimae interdum ad 5 cm. longae, oblongo-lanceolatae, subacutae, subconvolutae. *Pedicelli* 0·5–2·5 cm. longi. *Ovarium* angustum, 6–11 mm. longum. *Calyx* campanulatus, subtruncatus, 4–6 mm. longus. *Petala* 2–2·5 cm. longa, 5–6 mm. lata, lanceolata, acuta, membranacea. *Labellum* 4·5–5 cm. longum et latum, suborbiculare, bifidum, pallide purpureo-roseum, immaculatum. *Staminodium* laterale 2·5 cm. longum, 6–7 mm. latum, cuneato-oblanceolatum, obtusum, emarginatum, pallide purpureo-roseum.

PORTUGUESE EAST AFRICA. In the swamps at Dondo, near Beira, *Hon. Mrs. Evelyn Cecil*, 248.

859. **Lapeyrousia rhodesiana**, *N. E. Brown* [Iridaceae-Ixieae]; affinis *L. Welwitschii*, Baker, sed ramis angulatis, floribus majoribus, perianthii segmentis multo latioribus et styli ramis bifidis differt.

Herba 25–40 cm. alta, glabra. *Caulis* superne corymboso-ramosus, angulatus. *Folia* 3–4, erecta, linearia, acuta, 7·5–25 cm. longa, 1·5–5 mm. lata. *Corymbus* 7·5–25 cm. diam., sublaxus, ramulis angulatis, 2–3-floris. *Spathae* 4–5 mm. longae, late oblongae, obtusae, apiculatae, membranaceae, multinerves, brunneae. *Perianthium* caeruleum; tubus 8–10 mm. longus, angustissime infundibuliformis; lobi aequales, 8–9 mm. longi, 3·5–4·5 mm. lati, oblongi vel elliptico-oblongi, subacuti vel obtusi. *Antherae* lineares, 3·5 mm. longae. *Stylus* exsertus, apice trifidus, ramis bifidis.

RHODESIA. Mashonaland: at Headlands, between Salisbury and Umtali, on flat ground, *Hon. Mrs. Evelyn Cecil*, 154.

860. **Gladiolus bellus**, *C. H. Wright* [Iridaceae-Ixieae]; *G. blando*, Ait., valde affinis, perianthii tubo multo longiore differt.

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Caulis erectus, teres, glaber vel minute pubescens. *Folia* 45 cm. longa, 7 mm. lata, linearia, longe acuminata, glabra, circa 10-nervia, nervis marginalibus incrassatis. *Pedunculus* 40 cm. altus, supra medium unibracteatus. *Racemus* 15–25 cm. longus, floribus 8–10, distantibus. *Spathae* e basi ovata lanceolatae, rubrotinctae, exteriores 5–5·5 cm. longae, interiores circa 4 cm. longae. *Perianthii* tubus 5·5 cm. longus, 2 mm. diam., abrupte curvatus, apice leviter infundibuliformis; segmenta obovata, obtusa, 4–5 cm. longa, 1·2–2·5 cm. lata, alba, area deltoidea purpureostriata. *Stamina* 2·5–3 cm. longa. *Capsula* oblonga, obtusa, circa 1·7 cm. longa.

BRITISH CENTRAL AFRICA. Nyasaland: Zomba Plateau, *Whyte;* Mlanji, 1800 m., *Mahon;* Tuchila Plateau, 1800 m., *Purves*, 4.

861. **Chlorophytum asphodeloides**, *C. H. Wright* [Liliaceae-Asphodeleae]; a *C. pubifloro*, Baker, floribus glabris differt.

Herba 30 cm. alta. *Folia* lineari-lanceolata, longe acuminata, circa 25 cm. longa, 1 cm. lata, glaberrima, compacte 20-nervia, marginibus integris, laevibus. *Scapus* teres, 2 cm. altus, paniculatim ramosus; bracteae approximatae, lanceolatae, acuminatae, ultra 1·5 cm. longae, nervis prominentibus, marginibus acumineque albo-scariosis; bracteolae ovatae, 3 mm. longae; flores 2–3-fasciculati. *Perianthium* album, ultra 1 cm. diam.; segmenta oblonga, obtusa, 2 mm. lata, medio trinervia. *Filamenta* 3·5 mm. longa, complanata; antherae oblongae, obtusae, 1·5 mm. longae. *Ovarium* oblongum; stylus filiformis. *Capsula* 5 mm. longa, 4 mm. lata, profunde trilobata, marginibus incrassatis. *Semina* nigra, compressa, suborbicularia, 2 mm. diam., laevia.

BRITISH CENTRAL AFRICA. Nyasaland: Tuchila Plateau, Mlanji, 1800 m., *Purves*, 18.

862. **Chlorophytum glabriflorum**, *C. H. Wright* [Liliaceae-Asphodeleae]; *S. pubiflorum*, Baker, simulans, floribus glabris differt.

Herba glabra, circa 1 m. alta. *Folia* lineari-lanceolata, 35 cm. longa, vix ultra 1·5 cm. lata, compacte 30-nervata, minute papillosa, marginibus cartilagineis scabris, primum ciliatis. *Panicula* multiflora; bracteae late ovatae, acutae, trinerves; pedicelli 4 mm. (fructiferi 12 mm.) longi, medio articulati; flores 2–4-fasciculati, fere 1·5 cm. diam. *Perianthium* album; segmenta oblongo-lanceolata, acuta, 2 mm. lata, medio trinervia. *Filamenta* 5 mm. longa; antherae lanceolato-sagittatae, 1·5 mm. longae. *Ovarium* oblongum, trilobum; stylus filiformis. *Capsula* profunde trilobata, 8 mm. longa, 6 mm. lata, marginibus incrassatis cartilagineis. *Semina* nigra, compressa, 2 mm. longa.

BRITISH CENTRAL AFRICA. Nyasaland: Tuchila Plateau, Mlanji, 1800 m., *Purves*, 17.

863. **Hymenophyllum Thomassetii**, *C. H. Wright* [Filices-Hymenophyllaceae]; *H. tunbridgensi*, Sm., proximum, frondorum segmentis et involucris subintegris differt.

Rhizoma repens, gracile. *Stipes* erectus, gracilis, glaber, circa 1 cm. longus. *Lamina* bipinnatisecta, 5 cm. longa, 2·5 cm. lata,

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glabra; segmenta linearia, 0·7 mm. lata, praesertim versus apices minutissime serrata; rhachis anguste alata. *Sori* quasi-axillares ad rhachin; involucrum breviter ovatum, integrum vel minutissime dentatum.

BRITISH CENTRAL AFRICA. Mount Mlanji, 2400 m., *Thomasset.*

XXVII.—MIRACULOUS FRUITS OF WEST AFRICA.

(*Sideroxylon dulcificum*, A. DC.)

Travellers in tropical Africa have frequently drawn attention to the existence of a plant whose fruit could change the flavour of the most acid substance into a delicious sweetness. The plant is a member of the natural order *Sapotaceae*. It is known to the Fante races as *assarbah*, and in the Accra and Adampe districts of the Gold Coast as *tahmé*. It is indigenous to Ashante, and extends to Popo, Dahomey, Yoruba, and many districts in the Gulf of Guinea. The tree is seldom found near the coast. The largest quantities of fruits are obtained from a considerable distance inland, and from localities with rich and loamy soils.

A full account of the plant is given in the *Pharmaceutical Journal*, Vol. XI. (1852), pp. 445–448, by Dr. Daniell, under the name of *Synsepalum dulcificum*. In De Candolle, Prodromus VIII., p. 183, it is described as *Sideroxylon dulcificum*, DC., the name now adopted. It is a small tree or shrub with leaves four to five inches long, crowded at the ends of the branches. The flowers are small and numerous, produced in the axils of the leaves. The fruit resembles a small plum with the seed invested in a thin soft pulp, wherein lies the peculiar sweetening property.

A somewhat similar property to that described as existing in *Sideroxylon dulcificum* is also said to exist in a plant belonging to the natural order *Scitamineae*. This is the *katemfe* or *katemphe* of the Akoos and other Yoruba tribes, and is the "miraculous fruit of the Soudan." It is described in the *Pharmaceutical Journal*, Vol. XIV. (1855), p. 159, as *Phrynium Danielli*, Bennet, the name under which it is now known being *Thaumatococcus Danielli*, Benth.

With regard to the *Sideroxylon* fruits Mr. W. H. Johnson, Director of Agriculture, Gold Coast, informs me that he has found them particularly useful when taking quinine for fever, and that if a lemon be sucked within two or three hours of eating one of the fruits its acid flavour is entirely counteracted.

With the view of having the properties of these plants investigated plants were obtained from Lagos in 1889, and distributed to India and several of the Colonies, but as yet no record concerning them has been received at Kew.

J. M. H.

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XXVIII.—THE EBEN TREE OF OLD CALABAR.

(*Pachylobus edulis*, G. Don.)

The Eben tree is cultivated in various parts of Old Calabar for the sake of its fruits, the outer portion of which is eaten after being boiled or roasted. Examples of these fruits were first sent to Kew with this name by the Rev. Hugh Goldie in January, 1888. These were collected in Creektown. The writer's attention was directed to them, ten years later, by the Keeper of the Museum at Kew, who suggested that on his return to West Africa the writer should furnish material adequate to admit of accurate determination. At the time this suggestion was made the fruits were believed to belong to a tree of the natural order *Laurineae*. The specimens the writer was able to supply were taken from an Eben tree in the Botanic Garden at Old Calabar. They reached Kew in 1898, and showed that the Eben tree is *Pachylobus edulis*, G. Don (Natural Order *Burseraceae*). In September, 1905, Mr. McLeod, of the Forestry Department, Southern Nigeria, sent another specimen collected at Uwet, on the Calabar River. There were no fruits with the Uwet specimen.

The species has been figured in *Hooker's Icones Plantarum*, t. 2566–7 (1899), where its synonymy and distribution are stated to be as follows :—

"**Pachylobus edulis**, G. Don, Syst. ii., p. 89.

Canarium edule, Hook. f. in Hook. Niger Flora, 285.

Canarium edule, Hook. f. in Hiern Cat. Afr. Pl., Welw. i., 127.

Canarium Mubafo, Ficalho in Bol. Soc. Geogr. Lisbon, Ser. 2, p. 611, et Pl. Ut. Afr. Portug., p. 115.

Pachylobus Saphu, Engl. in Engl. & Prantl. Naturl. Pfl., Fam. iii., 4, p. 243.

Canarium Saphu, Engl. Jahrb., xv., p. 99.

"West Tropical Africa—

Island of St. Thomas ; G. Don.

Old Calabar ; Thomson.

Cameroons ; Mann, Preuss, Bucholz.

Cuzengo ; Welwitsch, 4482, 4483.

Wathen Station, or Ngombe, 34 miles below Stanley Pool ; Bentley.

"*Canarium Schweinfurthii*, Engl., a genuine Canarium having a thick, exceedingly dense and hard endocarp, has been confused with *Pachylobus edulis*, G. Don. Both trees yield an edible fruit and bear similar or perhaps in some districts the same name, and the leaves are sufficiently alike to deceive a superficial observer. The first-named is evidently very wide-spread, ranging from near the West Coast in Angola, eastward to the lakes and northward to Uganda.

"*Pachylobus edulis* is cultivated from St. Thomas and the Cameroons to the Congo at least, and it is figured here in consequence of Kew having received from the Rev. W. H. Bentley,

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of the Congo Baptist Mission, fruits purporting to represent the wild and cultivated varieties of the same tree—in reality the fruits of the two trees under consideration. Numerous specimens from different localities seem to establish the specific identity of *Pachylobus Saphu* with *P. edulis*. Indeed, Don's original specimen of the latter is labelled 'Safu,' and Don stated the fruit was a native of St. Thomas, and its fruit was sold in the island under that name."

"Eben" is the Eifik name, although Thomson, with the specimen referred to in the Icones, from Old Calabar (1863), does not mention the name, nor does he make any remark as to the uses to which it is put. Mr. McLeod gives the name "Eban" with his specimen (1905).

The writer observed the tree on the way to Uwet overland from Old Calabar; at Okuni on the left bank, and at Ikum on the right bank of the Cross River; but he does not remember having seen it at any place visited westward of the Old Calabar district.

The so-called African Elemi has been attributed to this species. *See* Planchon and Collin in "Les Drogues Simples," ii., 358, *Canarium edule*, Hook. f.; Moloney, "Forestry of West Africa," *Canarium edule*, Hook. f., "Mpafu" or "Mubafo"; Hiern., "Catalogue of Welwitsch's African Plants," i., 127 (stated here to also yield an oil), *Canarium edule*, Hook. f., more especially with reference to the specimens named "Mutafo" or "Nbafo"; but these statements, together with the note under "'Mpafu' tree of Tropical Africa," *Canarium* sp., in Kew Report, 1880, p. 50, doubtless apply to *Canarium Schweinfurthii*, Engl., the "Mpafu" of Uganda, "Mbafu" of Tanganyika, "Mupafu" of Mukenge, and "Mubafu" of Angola, as in Engler, "Pflanzenwelt Ost-Afrikas," B. 199, where the matter relating to the Elemi and oil seems to be, perhaps for the first time, accurately put. There are several specimens of *Canarium Schweinfurthii* in the Museum which bear out this view.

J. H. H.

XXIX.—MISCELLANEOUS NOTES.

Mr. WALTER HACKETT, Foreman of the Tropical Department of the Royal Botanic Gardens, has been appointed Assistant Curator of the Botanic Garden, Liverpool. Mr. Hackett entered Kew as a young gardener in September, 1897. He was promoted Sub-foreman of the Tropical Department in January, 1899, and Foreman of the same Department in 1901. The vacancy caused by Mr. Hackett's resignation has been filled by the transfer of Mr. C. P. Raffill from the Temperate House, while Mr. William Taylor, Sub-foreman in the Tropical Department, succeeds Mr. Raffill as Foreman of the Temperate House.

WILLIAM MATHEWS, M.A., F.R.G.S. — In June, 1901, Mrs. Mathews communicated to Kew the desire of her husband

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to dispose of his botanical collections where they would be useful, and offered to send the whole to Kew to be retained there or be presented to other establishments, as the Director should advise. The offer was accepted, and, by mutual agreement, the excellent British collection was presented to the Hastings Museum, Worcester, and the considerable Foreign collection, with the exception of a few specimens retained for Kew, was presented to the herbarium of Glasgow University. Mr. Mathews died at Broadwater Down, Tunbridge Wells, on the 5th September, 1901, and since his death Mrs. Mathews has found sundry other collections of dried plants which she has transmitted to Kew. Among them were a few from Iceland which have been incorporated in the Kew Herbarium. The others, comprising between 600 and 700 specimens, have been sent to Glasgow. Mr. Mathews was born at Hagley, near Birmingham, in 1828, and was educated at King's College, London, and St. John's College, Cambridge. After taking the degree of M.A., he joined the Birmingham firm of land surveyors of which his father was the head. He began studying botany at Cambridge under Babington, and after his return to Birmingham pursued the subject with great ardour, soon becoming an authority on the flora of Warwickshire and Worcestershire. He was a contributor to the *Phytologist*, the *Journal of Botany*, to Bagnall's *Flora of Warwickshire*, and to Lees's *Botany of Worcestershire*, and was the author of a *Flora of the Clent and Lickey Hills*. His travels abroad were chiefly in the Alps and Algeria, where he made the foreign collections alluded to above. The results of his study of the flora of Algeria are given in a little work entitled *The Flora of Algeria considered in Relation to the Physical History of the Mediterranean Region and supposed Submergence of the Sahara*, published in 1880. Mr. Mathews was also a geologist and a great climber of peaks. He was a personal friend of the late John Ball, and one of the co-founders of the Alpine Club, a contributor to its literature, and one of its early Presidents. In recognition of his geographical discoveries in the Italian Alps, he was decorated by King Victor Emmanuel with the Order of St. Maurice and St. Lazare.

Picea breweriana.—Arboriculturists will be interested to know that there is in the Kew collection of Conifers a specimen of this remarkable Spruce. The species has been found wild only on the summits of the Siskiyou Mountains in Northern California, and in one locality on the coast range of Oregon. One of the rarest of all trees, its numbers, even in a wild state, are, so far as is at present known, limited to a few scores. The Kew plant was presented to Kew in its seedling state by Professor Sargent, of the Arnold Arboretum, Mass., a few years ago, and it is, we believe, the only one alive in Europe. It is now about four feet high and in perfect health. The species was first discovered in 1884, but seeds were not collected till 1892. Of the thousands of young plants raised in the Eastern States of North America from these seeds, scarcely any survived, and a few grafted plants in the Arnold Arboretum are all that now remain.

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Picea breweriana belongs to the *Omorica* section of the genus —an interesting group known commonly as the "flat-leaved Spruces." They differ from the commoner Spruces (of which *P. excelsa* is the type) in the leaves being more or less flattened (not tetragonal), and in bearing stomata on the upper surface only. The group is remarkable for the curiously isolated habitats of its members; one is found in South-East Europe, one in the Himalaya, another in Japan, and two in Western North America. Recent exploration in China has also revealed the existence of allied species there. *P. breweriana* attains to a stature of over 120 feet, and is distinguished by its beautifully pendulous branchlets which, whilst being no thicker than a lead pencil, hang straight down six or eight feet in length. This characteristic is only to be seen in adult trees; the young specimen at Kew is of sturdy habit, and in general appearance similar to its ally, the Servian Spruce, *P. omorica*.

A photograph of the tree of *Robinia Pseudacacia* struck by lightning in the Royal Gardens on May 8th last and referred to in Bulletin No. 4, 1906, p. 124, has been placed in the Annexe of the Timber Museum, where are also a section from the base of the stem and a photograph of the Deodar shattered by lightning near the Palm House in August, 1885.

Lecythis Fruit. — Messrs. Bieber & Co., of Fenchurch Avenue, E.C., have recently presented to the Museum a fruit of an unknown species of *Lecythis* from Brazil. Its dimensions are:—Height, 11 ins.; greatest diam., 13½ ins.; weight empty, 8¼ lbs., of which the operculum or lid weighs 14 ozs. This will form an interesting addition to the series of these curious woody fruits placed in Case 56, Museum No. 1.

Chilian or Coquito Nut Palm (*Jubaea spectabilis*, H.B.K.).—The Museum is indebted to Prof. C. S. Sargent, Director of the Arnold Arboretum, for a sample of "Miel de Palma" or Palm Honey from Chile, prepared from the sap extracted from the trunk. A good tree, it is said, will yield as much as 90 gallons of sap, which is concentrated by boiling into the thickness of treacle. The fruits may frequently be met with in this country under the name of "Pigmy Cocoa Nuts" or "Stanley Nuts." The kernels are edible and are made into various kinds of confectionery. *See* Museum No. II., Case 62.

A fine specimen of this palm is growing in the Temperate House.

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Orchella Weed.—Under this name, which is usually applied to various species of *Roccella*, a specimen of Lichen from the West Coast of South America was recently received from a Liverpool firm for determination. The plant was found to be *Parmelia trulla*, Ach. This species, so far as can be gathered, has not been used for commercial purposes, although various other lichens, and among them several species of *Parmelia*, have been employed as substitutes for *Rocella*. None of these substitutes has been considered, however, to be of the same value as *R. tinctoria*.

Before the introduction of coal-tar dyes, Orchella or Orchil was largely used for dyeing, the principal species so employed being *Roccella tinctoria*. At the present time, Orchella is chiefly employed in the preparation of Litmus.

Oil-seeds.—Samples of Oil seeds for determination are frequently received at the Museum, more particularly from Liverpool and London firms. Of those recently submitted the following may be recorded :—

OWALA of GABOON, OPACHALA of the EBOE COUNTRY (*Pentaclethra macrophylla*, Benth.), a tree of the natural order *Leguminosae*, native of Upper Guinea, attaining a height of 50 or 60 feet. The thick woody pods are 20 to 25 inches long, and 3½ to 4 inches broad, and contain much-compressed dark brown shining seeds, samples of which have been frequently received from Liverpool oil merchants for determination.

The seeds are employed as food on the Niger, and the natives extract a fatty oil from them which they use for domestic purposes. The oil is also suitable for lubricating machinery, for candle-making and soap-making. The yield of oil is estimated to be 45 per cent., and the refuse cake after the expression of the oil is stated to contain 30 per cent. of albuminoids.

Specimens of the pods, seeds, and oil are exhibited in Case 43, Museum No. 1. A living plant will be found in the collection.

KUSAM LAC TREE of India (*Schleichera trijuga*, Willd.).—A large tree of the order *Sapindaceae*, found in the dry forests from the North-west Himalaya at Sirmor, throughout Central and Southern India, Burma and Ceylon, Java, Timor, &c. The fruit is ¾ to 1 inch long, containing one to three seeds, surrounded with a whitish pulpy edible aril. According to Dymock in "Pharmacographia Indica," the seeds yield an oil used for burning in lamps in India, and it is reputed to be the original Macassar oil, and is also stated to be a valuable stimulating and cleansing application to the scalp, which promotes the growth of the hair. The tree is further valuable as it affords a strong durable timber, employed to a considerable extent in India for oil and sugar mills, rice pounders, agricultural implements, &c. It is also considered the best tree for lac, known in commerce under the name of *kusam*.

An interesting series of products from this tree, including Macassar oil from the Dutch East Indies, and samples of "Samba"

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or "Key Nuts" and oil received from the neighbourhood of New Guinea, are shown in Case 27, Museum No. 1. A living plant will be found in the collection.

SHEA BUTTER TREE (*Butyrospermum Parkii*, Kotschy), found in Upper Guinea and Nile Land. It belongs to the natural order *Sapotaceae*, and attains a height of 30 to 40 feet, with a trunk 5 to 6 feet in diameter, branching like an oak, and yielding a copious milky juice which coagulates into a friable resinous substance, resembling an inferior quality of gutta. The fruit is ellipsoid, 1½ to 2 inches long with a thin pericarp, and usually contains a single seed with very thick cotyledons. A solid fat is obtained by the natives by drying the kernels in the sun, after which they are bruised and finally boiled, when the fat floats to the surface, and is skimmed off for use. This product is employed by the natives as food, for anointing their bodies, and also as a luminant. Shea butter is exported to Europe for the manufacture of soap, chiefly in combination with other oils. A gutta-like substance to the extent of ·7 to ·75 per cent. is present in Shea butter. *See* Kew Report for 1878, p. 38. Specimens of all these products are contained in Case 73, Museum No. 1. A living plant will be found in the collection.

Collection of Drawings of Orchids by the late John Day.—In September, 1902, Mrs. Wolstenholme, of High Cross, Tottenham, sister of Mr. John Day, well known during his period as an amateur grower of orchids, presented to Kew the very valuable collection of drawings of cultivated orchids made by that gentleman. Mrs. Wolstenholme had previously bequeathed the collection to Kew, but felt that she was delaying its usefulness by keeping it in her possession. As delivered at Kew, it consisted of 53 oblong books of about 90 pages each, with a complete index. The books have since been bound in 17 volumes, and they contain approximately 3,000 coloured drawings, with about 500 in sepia, besides copious original notes and a large number of cuttings from the "Gardeners' Chronicle" and other papers relating to orchids. We have not succeeded in finding any published biography of the author, and only a few scattered facts concerning his life and his collections. But Mrs. Wolstenholme has communicated the following particulars: John Day was born on February 3rd, 1824, in London, where his father, a city merchant, resided until 1840, when the family removed to a pleasant old house in Tottenham. After his father's death in 1851 he continued to live at the old home, and from there he married in 1853; but losing his wife in 1857, he sold the old home, and joined Mr. and Mrs. Wolstenholme at High Cross, Tottenham, the present residence of Mrs. Wolstenholme. Thither, in 1858, he removed his large collection of cultivated ferns, to which he had for some years devoted much attention. Shortly afterwards he took up the cultivation of orchids. He built suitable houses, and soon filled them with valuable plants. In course of time his collection became one of the richest and most famous of the period. Then his health broke down, and he visited the Mediterranean countries, which gave him a zest for

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travelling to more remote places, and he subsequently went to India, Ceylon, Brazil, and Jamaica. In 1881, previous to these longer journeys, his collection of orchids was brought to the hammer, and realised £7,000. Three plants of *Cypripedium Stonei*. var. *platytaenium*, fetched over £400. Subsequently he again became a collector of living orchids, chiefly of rare and curious kinds. But latterly he devoted much attention to the dried ferns he had collected on his travels. He died on January 15th, 1888, and his second collection of orchids was sold in May of the same year, when a small plant of the *Cypripedium* mentioned above brought the sum of £159 12*s*.

For some years Mr. Day employed Mr. C. B. Durham, a miniature painter, who exhibited largely at the Royal Academy and Suffolk Street galleries between 1828 and 1858, to make coloured drawings of orchids; and from a note in the Kew Correspondence there were 300 drawings by this artist made at a cost of £3 each. This collection, described as a very fine one, was sold by auction after Mr. Day's death, and is now the property of Mr. Jeremiah Colman, of Gatton Park, Surrey.

We have mentioned Durham, because his name occurs here and there in Day's books, appended to the drawing of a flower or a plant, and because he appears to have given Day lessons in drawing. In Book iv., p. 10, for instance, there is the note, appended to a drawing of *Cattleya bicolor*: "My 9th lesson." At p. 66 of the same book is a coloured drawing of *Cattleya Schilleriana splendens*, and the following note: "Drawn by Mr. Durham, June, 1862; the first drawing he ever did here. This from the plant bought at Mr. Allen's sale at Stevens's in June, 1860, and the subject of Mr. Durham's beautiful drawing in Vol. vii., p. 11."

In 1863 Mr. Day himself began sketching, the first sketch being dated January 10, and he continued to make drawings up to within a few weeks of his death, January 15, 1888; the last but one bearing the date November 12, 1887, the last being undated. All of the earlier ones are in ink; but in many places he afterwards added coloured sketches, always giving the date when done. The earliest sketches are somewhat rough and diagrammatic, though botanically correct; but he improved rapidly, and his later work was admirably executed, both as to drawing and colouring. Day must have been very industrious at that period, for by the middle of February, 1864, he was half way through his seventh book, where (page 45) there is a coloured figure of *Cypripedium purpuratum*, with the following note: "This is the first drawing I attempted in colours, using Gerty's paint box. I was sufficiently satisfied with the result to buy a box for myself." His satisfaction was quite justifiable, and his perseverance was soon rewarded with great success. Practically all he did after this was coloured. In December, 1882, he wrote to Kew applying for a pass of admission to the gardens before the general public, in order that he might make drawings of the "smaller, insignificant orchids." This was granted, and writing again in 1886 he mentions that he had drawn at least 70 that he had not seen elsewhere. His last Kew drawing is dated October 29, 1887. From time to time he presented living plants to Kew.

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The fact that the John Day collection contains drawings of a large number of the types of Reichenbach's species adds greatly to its value, as most of them are not otherwise represented at Kew, and probably in no other herbarium except the Reichenbachian shut up at Vienna, which, according to the terms of Reichenbach's testament, will not be accessible till 1914.

W. B. H.

Additions to the Herbarium during 1902.—Donations of specimens were made by more than eighty persons and institutions, and amounted to over 11,500 sheets. The specimens purchased amounted to about 6,500. The principal collections are enumerated below.

VARIOUS PARTS OF THE WORLD. *Presented*:—Cyperaceae, by Mr. C. B. Clarke; species of Selaginella described by Warburg and Hieronymus, by Botanic Garden, Berlin.

Purchased:—Kneucker, "Cyperaceae et Juncaceae Exsiccatae," lief. iii.–iv.; "Gramineae Exsiccatae," lief. vii.–x.

EUROPE. *Presented*:—"Kryptogamae Exsiccatae," Cent. viii., by the Imperial Natural History Museum, Vienna; "Hieraciotheca gallica et hispanica," fasc. xii., by M. G. Gautier; Herzegovina, by Mr. A. Callier.

Purchased:—Rehmann and Woloszczak, "Flora polonica exsiccata," Cent. ix.; Degen, "Gramina Hungarica," fasc. i.; Dahlstedt, Scandinavian Hieracia, Cent. xiv.

ORIENT. *Presented*:—Persia, by Mr. St. George R. Littledale; Syria, by the Rev. G. E. Post; Statice hybrids from the Canary Islands, by Dr. G. V. Perez.

Purchased:—Sintenis, Transcaspia and N. Persia, Cent. i.–iv*a*.

NORTHERN ASIA. *Purchased*:—Karo, Amur Region.

CHINA AND JAPAN. *Presented*:—E. H. Wilson, China and Tonkin, by Messrs. J. Veitch & Sons; Japanese Acer and Tilia, by Mr. Homi Shirasawa.

INDIA. *Presented*:—Simla Herbarium of the late Col. Sir H. Collett, by Mr. E. Collett; Bombay, by Dr. T. Cooke, C.I.E.; Johore, by Mr. C. H. Ostenfeld; Upper Burma, by Sir D. Brandis, K.C.I.E.; Penang, by Botanic Gardens, Penang; various parts of India, by Botanic Gardens, Calcutta.

MALAYA. *Presented*:—Weinland, New Guinea, by Botanic Garden, Berlin; Tengger Mts., Java, by Botanic Gardens, Buitenzorg.

AUSTRALIA. *Presented*:—West Australia, by Dr. A. Morrison; Victorian Characeae, by the Rev. F. M. Reader; rare Australian species, by Mr. J. H. Maiden; duplicates of Robert Brown's Australian Euphorbiaceae, by the British Museum (Nat. Hist.).

Purchased:—Pritzel, West Australia.

NEW ZEALAND. *Presented*:—Set of Veronica and Gentiana, by Mr. T. F. Cheeseman.

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TROPICAL AFRICA. *Presented*:—Gold Coast, by Mr. W. H. Johnson; Dawodu, Lagos, by Sir W. MacGregor, K.C.M.G., C.B.; Angola, by Mr. J. Gossweiler; Sudan, by Mr. A. F. Broun; Uganda, by Mr. J. Mahon; Zanzibar and Pemba, by Mr. R. N. Lyne; Nyasaland, by Mr. J. McClounie; various German collections, by Botanic Garden, Berlin.

Purchased:—Zenker, Cameroons; Kässner, British East Africa; Busse, German East Africa.

MASCARENE ISLANDS. *Presented*:—Seychelles, by Mr. H. P. Thomasset.

SOUTH AFRICA. *Presented*:—Komati Poort, by Lieut. J. W. C. Kirk; Major A. J. Richardson, Orange River Colony, by Mrs. Richardson; Natal, by Botanic Gardens, Durban; Namaqualand, by Miss E. Foxwell; various parts of South Africa, by Dr. H. Bolus; do. by Dr. Hans Schinz.

NORTH AMERICA. *Presented*:—Grasses of the Western United States, by the United States Department of Agriculture; "Exsiccatae Grayanae," by the Gray Herbarium of Harvard University; Western Minnesota Mosses, by Prof. J. M. Holzinger; North American Trees, by the Arnold Arboretum; Californian Lichens, by Dr. H. E. Hasse.

Purchased:—Rosendahl and Brand, Vancouver Island, Cent. i.; Cusick, Eastern Oregon; H. M. Hall, San Jacinto Mountains, California; Elmer, Monterey, California; Trask, Sta. Catalina, California; C. F. Baker, West Central Colorado; Eggleston, Vermont; Curtiss, Southern United States, ser. viii.

CENTRAL AMERICA. *Presented*:—Langlassé, Mexico, by M. M. Micheli; Palmer, Acapulco, by the Gray Herbarium of Harvard University.

Purchased:—Tonduz, Costa Rica.

WEST INDIES. *Presented*:—Heller, Puerto Rico, by the New York Botanic Garden; Britton and Cowell, St. Kitts, by the New York Botanic Garden; Jamaican Fungi, by the Department of Public Gardens and Plantations, Jamaica.

TROPICAL SOUTH AMERICA. *Presented*:—British Guiana, by Mr. G. S. Jenman; Langlassé, Colombia, by M. M. Micheli.

Purchased:—Miller and Johnston, Margarita Island, Venezuela.

TEMPERATE SOUTH AMERICA. *Presented*:—Chile and Argentine Frontier, by Mr. H. J. Elwes; Chilian Ferns, by Staff-Surgeon S. W. Johnson.

Purchased:—Dusén, Chilian and Patagonian Mosses.

The most important accession was the first set of E. H. Wilson's Chinese plants, collected during his first journey for Messrs. J. Veitch & Sons, by whom the set was presented. The collection contained about 2,700 numbers, chiefly from Western Hupeh. The complete nature of the specimens deserves remark, both flowers and fruit having been collected in a very large number of instances.

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Another valuable addition was the Simla Herbarium of the late Col. Sir Henry Collett, K.C.B., presented by his brother, Mr. Edward Collett. It is the type collection from which Collett's *Flora Simlensis* was elaborated.

An interesting set of specimens from Mahé, Seychelles Group, was contributed by Mr. H. P. Thomasset, who has devoted much time to the investigation of the rarer trees of the island.

A fine series of specimens of *Pachira aquatica*, Aubl., and *P. insignis*, Savigny, accompanied by fruits, was communicated by the late Mr. G. S. Jenman, and was exhibited at a meeting of the Linnean Society of London (*see* Proc. Linn. Soc. 1901–1902, p. 11). It was found that the two species were best distinguished by their flowers, and that they could not be distinguished by their fruits, which exhibited great parallel variations in size and shape.

Additions to the Herbarium during 1903.—Donations of specimens were made by about one hundred persons and institutions, and amounted to over 36,000 sheets. The specimens purchased amounted to over 10,000 sheets. The principal collections are enumerated below.

VARIOUS PARTS OF THE WORLD. *Presented:*—The Herbarium of the late Dr. R. C. Alexander Prior, bequeathed by him.

Purchased:—Kneucker, "Cyperaceae et Juncaceae Exsiccatae," lief. v.; "Gramineae Exsiccatae," lief. xi.–xiv.; "Carices Exsiccatae," lief. xi.

EUROPE. *Collections presented:*—Hampstead Herbarium of the late Richard Heathfield, Q.C., by Mrs. Cooke Yarborough; Algae of the Faeroe Islands, by Herr F. Börgesen; "Herbarium Florae Rossicae," fasc. xix.–xxiv., by the Imperial Botanic Garden, St. Petersburg; "Flora Exsiccata Austro-Hungarica," Cent. xxxv.–xxxvi., by the University Botanical Museum, Vienna; "Kryptogamae Exsiccatae," Cent. ix., by the Imperial Natural History Museum, Vienna.

Collections purchased:—Wittrock, Nordstedt and Lagerheim, "Algae aquae dulcis exsiccatae," fasc. xxx.–xxxv.; Rabenhorst, "Fungi Europaei," ser. II., Cent. xliv.; Briosi and Cavara, "I Funghi Parassiti," fasc. xv.; Dahlstedt, Scandinavian Hieracia, Cent. xv.; Degen, "Gramina Hungarica," fasc. ii.–iii.; Stribrny, "Plantae Bulgaricae Exsiccatae," Cent. iv., *part.*

ORIENT and CENTRAL ASIA. *Presented:*—Cyprus, by Miss M. E. Lascelles.

Purchased:—Bornmüller, "Iter Persicum alterum, 1902"; Sintenis, Transcaspia and North Persia, Cent. iv*b*.—x*a*.

JAPAN. *Purchased:*—Okamura, "Algae Japonicae Exsiccatae," fasc. ii.

INDIA. *Presented:*—Bandelkhand, by Mrs. A. S. Bell; Malay Peninsula, by Botanic Gardens, Singapore; various parts of India, by Botanic Gardens, Calcutta.

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AUSTRALIA. *Presented*:—West Australia, by Mr. G. H. Thiselton-Dyer.

Purchased:—C. Andrews, West Australia; Max Koch, South Australia.

POLYNESIA. *Presented*:—Hawaii and Fiji, by Mr. H. B. Guppy.

TROPICAL AFRICA. *Presented*:—Warnecke, Togoland, by Botanic Gardens, Berlin; Nyasaland, by Mr. J. McClounie; Whyte, British East Africa, by the British Museum; do., by Mr. A. Whyte; British East Africa, by Mr. C. F. Elliott; Portuguese East Africa, by the Ven. Archdeacon W. P. Johnson; Somaliland, by Major Appleton; Sudan, by Mr. A. F. Broun; Grasses, by the Natural History Museum, Paris; do., by Dr. J. A. Henriques.

Purchased:—Zenker, Cameroons.

MASCARENE ISLANDS. *Presented*:—Seychelles, by Mr. H. P. Thomasset.

NORTH AMERICA. *Presented*:—Arctic North America, by Mr. D. T. Hanbury; Canada, by Geological Survey of Canada; Crataegus, by the Arnold Arboretum; Seymour and Earle, Economic Fungi, Suppl. C, by Mr. G. P. Clinton.

Purchased:—Holway, "Uredineae Exsiccatae et Icones," fasc. iv.; Weiz, Labrador; Rosendahl and Brand, Vancouver Island, Cent. ii.; C. F. Baker, West Coast, North America; Elmer, California; Heller, California.

CENTRAL AMERICA. *Presented*:—Various parts, by Capt. J. Donnell Smith; Mexico, by Mr. C. G. Pringle; Gaumer, Yucatan, fasc. i., by the Field Columbian Museum, Chicago.

WEST INDIES. *Presented*:—Jamaica, by the Department of Public Gardens and Plantations, Jamaica.

Purchased:—Curtiss, Bahamas.

EAST TROPICAL SOUTH AMERICA. *Presented*:—Gran Chaco, Paraguay, by Mr. Andrew Pride.

Purchased:—Hassler, Paraguay; Robert, Matto Grosso.

WEST TROPICAL SOUTH AMERICA. *Presented*:—Williams, Bolivian Mosses, by the New York Botanical Garden.

Purchased:—H. H. Smith, Santa Marta, Colombia.

The most important accession was the Prior Herbarium, which has already been noticed (*Kew Bull.*, 1903, p. 32).

Three valuable Tropical American collections were received during the year. The most extensive was the second set of H. H. Smith's Santa Marta plants, which contained nearly 2,500 specimens. Mr. Smith's original plan was to explore the whole Department of Magdalena, Colombia, but he was prevented from doing so by a civil war which broke out in 1899, and made travelling practically impossible. Consequently he was restricted to a limited area, extending about 50 miles east of the town of Santa Marta and 40 miles south, never more than 30 or 35 miles

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from the coast. Mr. Smith considers that his collection is very nearly complete for altitudes below 4,000 feet; it is certainly one of the finest botanical collections made in a limited area in South America. The first set is in the Herbarium of the New York Botanical Garden, and has been named in large part by Dr. H. H. Rusby, with the co-operation of specialists.

A further instalment was received of Hassler's Paraguay plants, amounting to nearly 1,500 sheets. It included his collections of the years 1900-1902. Most of the determinations have already been published in the *Bulletin de l'Herbier Boissier*, under the title *Plantae Hasslerianae*, edited by Dr. R. Chodat, who still continues the list, in collaboration with Dr. Hassler. Many of the orders have been worked out by specialists.

A valuable collection of more than 1,000 Mexican plants was received from Mr. C. G. Pringle, in part exchange for the late Dr. Prior's set of Hooker and Thomson's Indian plants. It included Mr. Pringle's collections of 1901 and 1902, and his re-issued species of the same years.

A set of over 1,200 West Australian plants, collected by Mr. Cecil Andrews, was acquired by purchase.

One of the most interesting accessions was a collection of nearly 100 drift-fruits and seeds from the Pacific, presented by Mr. H. B. Guppy, who has embodied the results of his observations in a volume on plant dispersal in the Pacific (*Observations of a Naturalist in the Pacific between* 1896 *and* 1899. Vol. II. London, 1906).

Nymphaea capensis, *Thunb.*—Through the courtesy of Dr. F. R. Kjellman, Director of the Botanic Garden, Upsala, Kew has had the type specimen of *Nymphaea capensis* on loan, and Mr. J. R. Drummond furnishes the following note on the results of his comparison of the South African and Indian forms often referred to *N. stellata*, Willd.

Nymphaea capensis, Thunberg in Prodromus Plant. Cap. Pars Post., p. 92 (1800). Specimen authenticum ex Herb. Upsal.

In the joint opinion of Mr. N. E. Brown and the writer of this note, the following are identical with the above, viz., *Nymphaea scutifolia*, A. P. de Candolle in Syst. Nat. II. 50 (1821); also *N. caerulea*, Dryander ined. ex Sims, *Bot. Mag.* t. 552 (1801); also Andr. Rep. t. 197; and *N. stellata* of Harvey in *Flora Capensis*, I. 14, (not of Willd.).

We have not seen Krause No. 1235, *Flora Cap- und Natal-landes*, p. 25, which is the *N. capensis*, Thunb. of Meisner in Hooker's *London Journal of Botany*, I. 461, but as Krause collected it in the Zitzikamma river "Uitenhage," that was probably the true plant of Thunberg, whose name was otherwise lost sight of, partly owing to the brevity of his description, but partly owing to comparison with dried specimens and figures of other Nymphaeas, notably with the Egyptian *N. caerulea* of Savigny and the *N. stellata* of Willd., a very different form which, though

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allied to certain West African types, does not occur in South Africa. The true *N. capensis* is represented in the Kew Herbarium by the following examples:—

457 Zeyher, in the Zwartkop River, District of Uitenhage;

4202 Burchell, collected in Bushman's River, near Rautenbach's Drift, Albany Div., Nov. 2, 1813 [this is the type of *N. scutifolia*, D.C.]; 19 Ecklon and Zeyher, 1835, "in rivulo prope 'Zeekoe-valley' (Cap) et in fluvio 'Zwartkop's Rivier' (Uitenhage) Jan-Mart";

[In the river at Enon, Uitenhage Division] South Africa, Drege; 1084/P.M.O. Macowan, in fluvio Zwartkopsa Uit. [c. 1867]; 701 Macowan and Bolus, in alveo fluminis Zwartkop's Rivier prope Uitenhage, Dec. 1886; 1041 R. Baur, Enon. b. Uitenhage; 2261 Wolley-Dod, Retreat Vley [leaf doubtful].

Other specimens from South Africa referred to *N. capensis*, *N. scutifolia* and *N. stellata*, are more or less unsatisfactory or doubtful, and those from the Transvaal and Zambesi region rather approach *N. zanzibariensis*, Caspary, a form united with *N. scutifolia*, DC., by Hook. fil. and others, but probably a good species.

N. capensis, Thunb., seems to be endemic in South Africa from Cape Town to the Natal border, in rivers and pools, chiefly near the coast; the forms from Madagascar and the Comoro group that have been referred to the same species appear to be distinct, and are probably, as most species of the genus evidently are, very local in their distribution.

Thunberg's plant was doubtless that given by Breyn (Prodr. II., p. 86, 1739 ed.) as "Nymphaea flore caeruleo odoratissimo Capitis Bonae Spei"; De Candolle quotes the same description from the earlier edition (1689), which is the first mention seemingly of this species. It was afterwards confounded with the scentless Egyptian rice-field plant by Ventenat (Malmaison, 6), and with *N. stellata*, Willd., under which designation it appears in Bolus and Wolley-Dod (Trans. S. Afr. Phil. Soc. XIV. 207) as "locally frequent in Vleys." Thunberg's own type appears from Schultes' edition of the *Flora Capensis* to have been collected in the Langekloof country in the month of December. A *Nymphaea* from the Durban flats, figured by Wood and Evans in *Natal Plants*, Vol. I. t. 33, p. 29, as *N. stellata*, Willd., is not apparently *N. capensis*, Thunb., nor *N. stellata*, Willd., but rather to be compared with *N. madagascariensis*, DC., and its immediate allies. Conard ("The Waterlilies," Washington, 1905) has duly reduced *N. scutifolia*, DC., to *N. capensis*, Thunb., but we have not been able to follow his citation of the specimens altogether, and he does not appear to have seen the actual type of Thunberg. There are good examples of *N. scutifolia*, DC., all from the same region as those in the Kew Herbarium, at the British Museum.

Saussurea hieracioides, Hook. f.—Mr. J. R. Drummond, who has had occasion to examine some specimens of *Saussurea* in the Kew Herbarium, has made the following note on the forms described as *S. hieracioides* by Sir J. D. Hooker and as *S. villosa*

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by the late Mr. Franchet respectively. In the light of more complete material now available for study, it transpires that the two are conspecific.

Saussurea villosa, Franch. in *Journ. de Bot.*, Vol. II. (1888), p. 353 = *Saussurea hieracioides*, Hook. fil. in Fl. Br. Ind. III. 371.

S. hieracioides, Hook. fil., was founded on a single gathering from Tungu in Sikkim, and named with reference to the radical leaves which recall those of *H. pilosella*, Linn.

Franchet based his *S. villosa* on a Yunnan plant, No. 34 Abbé Delavay, which he distinguished from *S. hieracioides* by the heads (in *villosa*) being smaller, and by the long bristles of the receptacle. In all the examples then known, and in a plant collected in Kansu by Przewalski, which has a large head like that of the specimen now received for examination, the scapes bore one head only, but in No. 589, collected by the late Abbé Soulié in Tachienlu, which in habit and the outline of the radical leaves connects *hieracioides* and *villosa* completely, there is a scape with two heads, while in No. 63 from the same there are numerous heads in a rather close irregular corymb, No. 6762 Henry from Hupeh, which Mr. Hemsley has referred to *S. villosa*, Franch., has root leaves nearly a foot in length, and the scape is branched fastigiately for about the last five inches. 607 and 653 Pratt (Tachienlu) show the gradation in the leaves and heads quite plainly, and there can be no doubt that the whole material noted above as well as No. 370 Soulié belongs to one very variable species. I can find no difference in the paleae, which indeed seem to vary in the same capitulum. The flowers have the smell of the European *Centaurea nigra*, Linn.

HAB. Alps of Indo-China 9–13,000′ from Inner Sikkim to Yunnan and the Kiala Province of West China.

Botanical Magazine for June.—The plants figured are *Magnolia hypoleuca*, Sieb. et Zucc., *Gonioscypha eucomoides*, Bak., *Gerbera aurantiaca*, Sch. Bip., *Gladiolus primulinus*, Bak., and *Rhododendron Vaseyi*, A. Gray, all of which are in cultivation at Kew. The *Magnolia* is a distinct species, native of Japan and China, valued in the former country for its timber and in China for the tonic medicine prepared from its bark and flowers. The latter are large, creamy white or white, and are produced when the leaves are nearly mature. The Kew plant, now about 14 ft. high, was raised from seed received from a Japanese nursery in 1890. *Gonioscypha* is a Liliaceous genus of the tribe *Aspidistreae*. *G. eucomoides*, the only species, is a native of the Eastern Himalaya. Mr. W. Bull, of Chelsea, first introduced it into cultivation, and he presented a plant to Kew about the year 1886. The *Gerbera* is a fine species from Natal and the Transvaal, having flower-heads 2–3 inches in diameter, the ray-florets bright blood-red above and yellow beneath. The Kew plant was purchased from Mr. Max Leichtlin, of Baden-Baden. *Gladiolus primulinus* is a tropical African species remarkable in having bright yellow flowers. The plant figured was sent to Kew by Mr. C. F. H. Monro, of Bulawayo, and flowered in a

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frame in September last. *Rhododendron Vaseyi* is found only in North and South Carolina, and its closest allies are natives of Japan. "It adds another to the now very numerous cases of remarkable relationship between the Chino-Japanese and the Alleghanian floras." The drawing was prepared from plants raised from seed communicated by Prof. Sargent in 1891.

Flora Capensis.—A further instalment of this work, prepared at Kew on behalf of our South African colonies, has appeared. This part, vol. iv., sect. i., part ii. (pp. 193–336), contains the conclusion of the genus *Erica* by the late Prof. Guthrie and Dr. Bolus. Although the conception of the species is by no means narrow, their number reaches the enormous total of 469, of which 87 are described here for the first time. The main features of the distribution of the species of *Erica* in South Africa have, of course, been known for a long time. They are so obvious that the most casual observer could not have overlooked them; but it is only now that we are able to gauge them accurately. About 90 per cent. are found in the "Coast Region," some of them extending to the "Central Region," and very few beyond it. "Their greatest concentration," as the authors say, "may be on the Cape Peninsula, where 92 species have been recorded in an area of 198 square miles; but the home of the more beautiful, and now rarer, species is in the Caledon Division." Many of the species are extremely local. The great variability of almost all the organs makes the discrimination of individual variations and of forms which might reasonably be treated as species extremely difficult, and demands much experience and tact, such as can only be acquired by continued observation in the field and the study of extensive collections. No men with better qualifications for that task than the authors could have been found.

Considering the extremely limited distribution of numerous species it is not surprising that not a few of them have been collected only once, and some no doubt have since become extinct or only exist in the cultivated state. Moreover, as the early collectors generally paid little attention to indicating the localities where they collected their specimens, we do not know and in some cases may never know the exact area of those species. So far about six per cent. of the Ericas of South Africa have had to be put down with the vague localisation "South Africa." South African heaths having been very much in fashion in European gardens at the end of the 18th and in the beginning of the 19th Century, a tendency developed towards unduly multiplying species by naming and describing, often inadequately, garden plants, which in many cases may have been hybrids, and of which specimens were not always preserved. This accounts for the unusually long list of "imperfectly known species"—there are 90 of them enumerated on pp. 310–312, and of "supposed hybrids" (129). Some of them will probably be found in continental herbaria which the authors were not able to consult, and may yet be cleared up with the aid of Guthrie's and Bolus's monograph.

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The last 21 pages of part ii., sect. i., of vol. iv., contain a portion of Mr. N. E. Brown's account of the smaller genera of South African *Ericaceæ* (*Philippia* to *Hexastemon*). Among them there is a new monotypic genus, *Platycalyx*, N. E. Br., discovered by Mr. Rust, near Riversdale. The species described by Mr. N. E. Brown number 36, of which nine are new. Their distribution exhibits the same peculiarities as that of the Ericas.

The authors were greatly assisted in their work by the courtesy with which the authorities in charge of the herbaria of Thunberg (Upsala), Harvey (Dublin), and Tausch (Prag) placed the *Ericaceæ* of those herbaria at their disposal. Moreover, Dr. Bolus lent the whole of his collections of the smaller genera of South African *Ericaceæ*, and Prof. Engler sent some of the types in the Berlin herbarium for comparison.

George Bentham.—Of the many distinguished botanists whose labours and liberality have materially advanced the progress of the Royal Gardens, Kew, as a scientific institution, no one approaches George Bentham for the duration, extent, and value of the services he rendered. Hence it is that the recent publication of a biography of that botanist* by Mr. Daydon Jackson, F.L.S. —for a copy of which the Library at Kew is indebted to the courtesy of the publishers—has an especial interest for the readers of the *Kew Bulletin*.

The materials for Mr. Jackson's work are compiled all but exclusively from an autobiography of 661 quarto pages, a diary for the years 1830 to 1883 in 20 closely written volumes, innumerable letters, and miscellaneous memoranda. These autobiographical MSS. offer advantages of singular value to the biographer, for they are written in a perfectly clear hand, without correction or erasure, in the methodical style that characterized their author's scientific writings. They describe many phases of a singularly varied life—social, literary, and scientific—for as son of a distinguished father—Sir Samuel Bentham—and nephew of the great Jeremy, as an accomplished linguist, and as possessing ample private means, he was welcome in the best society. To have sifted these materials amongst which there was no dross, and sorted the results, must have cost Mr. Jackson great labour and the exercise of no little judgment, and he may well be congratulated on the result in his faithful picture of his hero, of whom a good likeness fronts the title page.

It is not the purport of the *Bulletin* to offer a sketch of Bentham's life and work, of which not a few appeared shortly after his decease,† nor to indicate the numerous characteristic episodes of his life that Mr. Jackson has rescued from oblivion,

* English Men of Science: Edited by J. Reynolds Green, D.Sc.; George Bentham, by B. Daydon Jackson: London, J. M. Dent & Co., 1906.

† *See* obituary notices in the Journals of the Royal, Linnean and Geographical Societies; *Nature*, vol. xxx.; the Elogé, by Sir W. Thiselton-Dyer, in the Proceedings of the Linnean Society, vols. for 1877-79; that of Prof. A. Gray in the Journal of the American Society of Arts and Science, vol. xxix.; and a fuller biography in the Annals of Botany, vol. xii.

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for it is in his relations to Kew that this publication is concerned. These in a strict sense commenced in 1841, when Sir W. Hooker became Director of the Royal Gardens, and continued throughout that directorate and to within two years of the retirement of its successor. But having regard to the fact that the Library and Herbarium of the Royal Gardens were the *fons et origo* of the scientific status of that institution, the guardians of its nomenclature, and the depository of the proofs of its labours, Bentham's services in the formation of these must count, and they antedate the foregoing by 18 years. It was in 1823, when a resident in the South of France, that he visited England and took the opportunity of going to Glasgow to present letters of introduction to Dr. (afterwards Sir William) Hooker, then Professor of Botany in the university of that city. The two botanists foregathered on the spot. Each was forming a botanical library and herbarium, their scientific interests were one and the same, their friendship grew during three succeeding visits of Bentham to Glasgow and ripened into a life-long one. In 1854, finding that his income could not meet the demands for space of his rapidly enlarging library and herbarium, Bentham, with the Director's cordial approval, offered these to the Government for the use of the Royal Gardens, and they were, after some demur, accepted with the condition that they should be permanently attached to that institution and be accessible to scientific botanists. It must be borne in mind that up to that time the Royal Gardens possessed neither of these necessary implements for the conduct of its duties, the desideratum being supplied by the Director's private library and herbarium, the latter the most complete in existence; nor was it till after his death, 11 years subsequent to Bentham's gift being accepted, that the treasures accumulated by the Director were rescued from the auctioneer's hammer by the Government and the two Kew Herbaria united.

From 1854 till his decease Bentham resided in London, and during those 30 years he, with annual intervals of a few weeks for rest, repaired for five days a week to the Herbarium, arriving punctually at 10 a.m. and leaving at 4 p.m., never breaking his long fast of 10 a.m. to 8 p.m. Here he wrote his two Colonial Floras—*Hongkongensis* and *Australiensis*—*Handbook of the British Flora*, his successive classical annual addresses to the Linnean Society, the *Genera Plantarum*, and a host of minor botanical essays; here, too, he concluded the formation for the University of Cambridge of a consulting herbarium of 30,000 named species from duplicates of his own and that of his friend, Dr. Lemann, which had been left by the will of its founder to that university, subject to a selection by Bentham for his own purpose. This labour occupied him for ten years continuously and was gratuitous, the university providing only paper and the expense of mounting the specimens. During the whole of this 30 years his services were at the disposal of the Director and of the officials of the Garden and Herbarium in all cases where his vast knowledge, experience, and sagacity were sought.

J. D. HOOKER.

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Presentations to the Library during 1902.—Prof. C. S. Sargent presented 41 books or pamphlets including: *Ahern, Compilation of notes on the most important timber tree species of the Philippine Islands*, 1901; *Bontekoe, Gebruik en mis- bruik van de Thee*, etc., 1686; *Burckhardt, Aus dem Walde*, 1865–81, 10 vols.; *Clavé, Etudes sur l'économie forestière*, 1862; *Collection choisie de plantes et arbustes*, 1796, vol. i.; *Courtin, Die Familie der Coniferen*, 1858; *Demontzey, Traité pratique du reboisement . . . des montagnes*, ed. 2, 1882; *Gattinger, The Flora of Tennessee*, etc., 1901; *Jacobson, Handboek voor de kultuur en fabrikatie van Thee*, 1843, 3 vols., and *Handboek voor het sorteren . . . van Thee*, 1845; *Lorey, Handbuch der Forstwissenschaft*, 1888, 2 vols.; *Mackenzie, Manual of the Flora of Jackson County, Missouri*, 1902; *Miquel, Prodomus systematis Cycadearum*, 1861, and others, mostly dealing with shrubs or trees. The Bentham Trustees have presented the continuation of about 20 periodicals and the following: *Amatus Lusitanus, In Dioscoridis Anazarbei de medica materia libros quinque*, etc., 1558; *Dreves and Hayne, Choix de plantes d'Europe*, vols. i.–v., 1802; *Duhamel du Monceau, Des semis et plantations des arbres*, 1760; *Petermann, An account of the progress of the expedition to Central Africa, performed . . . under Richardson, Barth, Overweg & Voges in the years 1850–53*, 1854, and two fine copies of the *Ortus Sanitatis*; both are in Latin, one without place or date, but supposed to be about 1490, and the other was published at Mainz in 1491; this is the first dated Latin edition. *Britton, History of New South Wales from the Records*, vol. ii., and *Historical Records of New South Wales*, vols. i.–vi., 1893–98, with charts, were received from the Agent-General for New South Wales; 7 dissertations, from Prof. H. Solereder; 2 dissertations, from Prof. Ed. Schaer; *Davaine, Recherches sur l'anguillule du blé niellé*, etc., 1857, and the *Year-Book of Pharmacy*, 32 volumes, from Prof. A. H. Church; *Sachs, Text-Book of Botany*, 1875, *Curtis's Botanical Magazine, new edition . . . arranged according to the natural orders of W. J. Hooker*, vol. i., 1833, *Sir W. J. Hooker, A century of Ferns*, 1854, coloured, also a coloured copy of the *Second century of Ferns* in exchange for an uncoloured one, from Sir J. D. Hooker, G.C.S.I., who has also presented the continuation of several periodicals; *Moeller, Anatomie der Baumrinden*, 1882, from Sir W. T. Thiselton-Dyer, K.C.M.G.; *Arrhenius, Monographia Ruborum Sueciae*, 1840, from the Regius Keeper, Royal Botanic Garden, Edinburgh; *Ceron, Catálogo de las plantas del Herbario*, etc., Manila, 1892, from Dr. A. Henry; *De Wildeman, Études sur la Flore du Katanga*, fasc. 1 and 2, and other publications of the Musée du Congo, from the Secrétaire Général du Département de l'Intérieur, Brussels; *Dicksons & Co., A catalogue of Fruit and Forest Trees*, 1827, from Messrs. R. P. Ker & Sons; *Lelong, Culture of the Citrus in California*, 1900, from Mr. J. Burtt Davy; *Grew, The comparative anatomy of trunks*, etc., 1675, from Prof. C. S. Sherrington; *Kanjilal, Forest Flora of the School Circle, N.-W. P. [India]*, 1901, from Mr. J. S. Gamble, C.I.E.; *Marshall, Arbustrum Americanum*, etc., 1785, from the Director-in-Chief, New York Botanical Garden; *New Zealand Department of Agriculture, Conference of . . . Fruit-growers and Horticulturists*, 1901, from Mr. T. W. Kirk; *Sodiro, Contribuciones al conocimiento de*

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la flora ecuatoriana, monografia 1, 1900, from Mr. J. V. Sigvald Muller; *Moore, The Tanganyika problem*, 1903, from the Tanganyika Exploration Committee, through the Bentham Trustees; *Bulletin de la Société dauphinoise pour l'échange des plantes*, ix.–xiii., xvi., 1882–89, from Monsieur R. Buser; *Catalogue of Scientific Papers, compiled by the Royal Society of London, supplementary volume*, 1902, from the Royal Society; *Rumpf, Gedenkboek*, 1902, from the Director, Koloniaal Museum, Haarlem; *Day, Original drawings of Orchids*, 53 volumes and index, presented to Kew by the author's sister, Mrs. Wolstenholme. The following works have been presented by their respective authors: *R. T. Baker and H. G. Smith, A research on the Eucalypts, especially in regard to their Essential Oils*, 1902; *E. S. Barton (Mrs. Antony Gepp), The genus Halimeda*, 1901; *F. C. E. Börgesen, The Marine Algae of the Færöes*, 1902; *J. Briquet, Monographie des Centaurées des Alpes Maritimes*, 1902; *A. H. Church, Food-grains of India, supplement*, 1901; *O. Comes, Chronological tables for Tobacco*, 1900; *F. Coulombier, L'arbre à Thé*, 1900; *L. L. Dame and H. Brooks, Handbook of the Trees of New England*, etc., 1902; *F. H. Davey, A tentative list of the Flowering Plants . . . of Cornwall*, etc., 1902; *H. N. Ellacombe, In my vicarage garden and elsewhere*, 1902; *J. Gravereaux, Les Roses cultivées à L'Haÿ en 1902; W. R. Guilfoyle, Guide to the Botanic Gardens, Melbourne*, [1901?]; *C. W. W. Hope, The Ferns of North-Western India*, 1899–1902; *T. Husnot, Les Prés et les Herbages*, etc., 1902; *V. L. Komarov, Flora Manshuriae*, vol. i., 1901; *V. J. Lipsky, Ghornaya Bukhará*, etc., part 1, 1902; *C. H. Ostenfeld, Flora Arctica*, etc., part 1, 1902; *I. Palibin, Conspectus Florae Koreae*, part 3, 1901; *J. F. Payne, On the "Herbarius" and "Hortus Sanitatis,"* 1901; *R. A. Philippi, Analogien zwischen der chilenischen und europäischen Flora*, 1893, and *Botanische Excursion in das Araukanerland*, 1896; *G. Radde, Die Sammlungen des kaukasischen Museums, Botanik*, 1901; *J. Ramirez, Sinonimia . . . de las plantas mexicanas*, 1902; *J. C. Schoute, Die Stelär-Theorie*, 1902; *H. Shirasawa, Iconographie des essences forestières du Japon*, vol. i., text and atlas, 1899–1900; *F. B. Smith, Agriculture in the New World*, 1902; *W. A. Talbot, The Trees, Shrubs, etc., of the Bombay Presidency*, ed. 2, 1902; *J. W. H. Trail, the Flora of Buchan*, 1902. Many of the exceedingly useful publications of the United States Department of Agriculture have been presented by the Secretary.

The above list does not include numerous pamphlets which have been received from their respective authors, and others, many of them of considerable interest, which have been presented by Sir W. T. Thiselton-Dyer, K.C.M.G., from his own library.

Zapupe Fibre Plant.—During the past year considerable interest has been aroused in connection with a fibre plant known to the Mexicans under the name of Zapupe. From a note on the subject by the United States Consul at Tuxpam, published in the Monthly Consular and Trade Reports, Washington, U.S.A., No. 298 1905, it appears that for centuries past the Indians have employed

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its fibre for the manufacture of ropes, bags, lariats, bridles, cordage and seines, but it is only recently that attention has been seriously directed towards its industrial development.

The Zapupe plant is described as similar in appearance to the Henequen (*Agave sisalana*) of Yucatan, but differs from that plant in producing a greater number of leaves, which are also longer and more fleshy, with a needle-like thorn at the apex and with serrated margins. Leaf for leaf, Zapupe yields rather less fibre than Henequen, but the total yield per plant is greater owing to the greater number of the leaves. The plant readily reproduces itself, as a poling stem produces from 2,000 to 2,500 bulbils or young plants in addition to suckers from the roots of the stump.

The first crop of leaves may be harvested three years from the time of planting, and from the first to the third year after beginning to yield a plant will produce 100 to 110 leaves annually, gradually decreasing to between 75 and 80 leaves, continuing productive for about 15 years. Each plant will yield on an average from 2½ to 3 lbs. of fibre. The leaves may be gathered throughout the year, 20 to 25 being cut every 90 days. The plant requires but little attention. After the land has been cleared, the young plants are placed 6½ by 6½ feet apart each way, which allows of 1,000 to be planted to the acre. The plant is said to thrive best in a sandy and rocky environment.

The average yield mentioned in the U.S. Consular Report—40 to 48 oz. per plant—gives the average yield per leaf at about or under half-an-ounce. This seems low as compared with the Sisal plant as grown in India, where (*see* Agricult. Ledger, 1900, No. 6, p. 62) it has been found that 2 to 2½ oz. of fibre may be obtained from a single leaf. In this case the proportion of fibre to leaf was from 4¾ to 5½ per cent. This proportion was probably unusually high; in other cases the ratio of fibre to leaf has worked out at 3 to 3¼ per cent. The data supplied as regards Zapupe are insufficient to admit of exact comparison with Sisal, and more precise figures than have yet been given are desirable.

In collecting the leaves the labourers use a long-bladed knife with a sharp hook-like curve at the end, which is introduced between the stump and the leaf, and with a dexterous upward jerk the leaf is severed close to the stump. This is essential as an uneven, ragged stump will deteriorate and often die. The leaves are then made into bundles of 50, the needle-like points being cut off before they are taken to the cleaning shed for the extraction of the fibre. When properly extracted the fibre is described as being white, strong and flexible, and rope made from it is said neither to kink nor to mildew when exposed to dampness or when immersed in water.

In an article on the subject which appeared in the "Guadalajara Gazette" of March 25th last, it is stated that the principal proprietors of Tantoyucan in Vera Cruz have formed a company, with a capital of $100,000, to export the Huasteca fibre called Zapupe or Huasteca Henequen.

The excellent results obtained by the agriculturists of Tamaulipas and Coahuila from this plant have decided the people of Tantoyucan to follow their example. The shares of the new company have already been sold up to $40,000.

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Recently living Zapupe bulbils have been received at the Royal Gardens, through the Foreign Office, from H.M. Vice-Consul at Tuxpam. These are too small at present to admit of the determination of the species, but they suffice to show that Zapupe is a species of *Agave*. Efforts are being made to obtain further specimens of the plant and samples of the fibre for the Museum.

Bambarra Ground Nut.—The publication of the note on *Voandzeia subterranea*, Thou., at p. 68 of this volume has led to the communication by Dr. M. Greshoff to Mr. Burkill of the following interesting supplementary note:—

"In Western Java the beans are also eaten by the native, and known to them under the name Katjang bogor (Buitenzorg Beans), doubtless because the plant was introduced by the Botanic Gardens at Buitenzorg. In the Laboratory of the Colonial Museum at Haarlem (v. Bull. No. 26, 1901), we found this composition for the Java *Voandzeia*:—

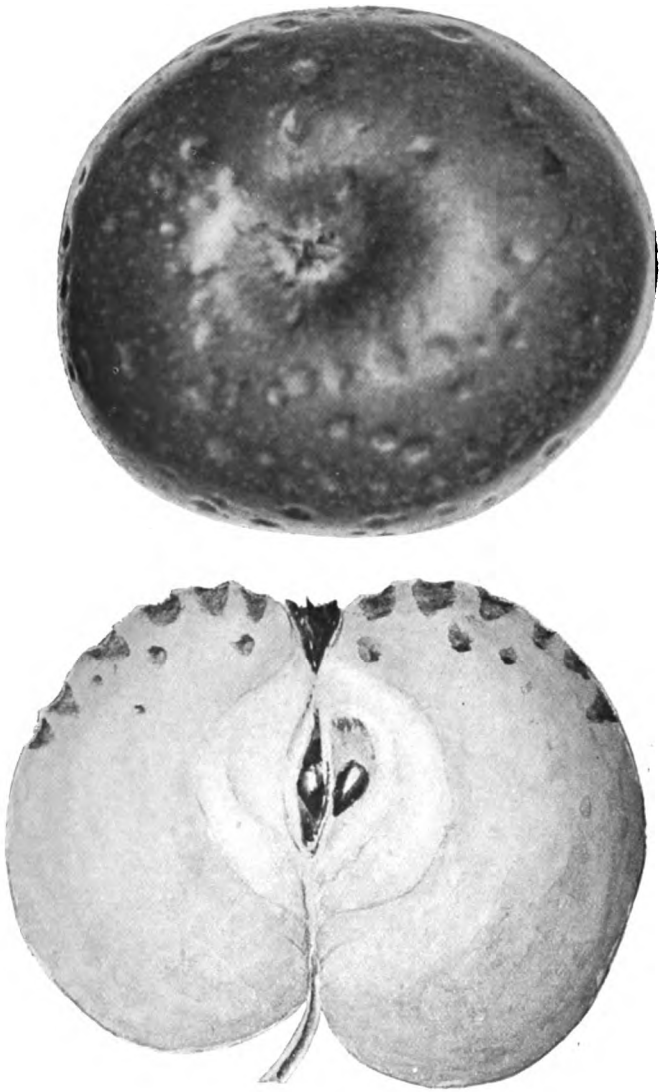
Water	12·78
Oil	6·41
Nitrogenous matter	19·12
Starch	49·28
Cellulose	5·79
Ash	3·33

"You see that the analysis does not differ very much from the analysis found by Thoms and by Balland."

Index Florae Sinensis.—A few copies of Nos. 1 to 10 and of Nos. 14, 17, 19, and 20 are still available for the use of those whose sets of the *Index* are incomplete. Librarians desirous of obtaining copies of these numbers are invited to make their wants known to the Keeper of the Herbarium.

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ROYAL BOTANIC GARDENS, KEW.

BULLETIN

OF

MISCELLANEOUS INFORMATION.

No. 6.] [1906.

XXX.—PLANT DISEASES. V.—DISEASED APPLES AND MELONS FROM THE CAPE OF GOOD HOPE.

(With Plate.)

The subjoined letter has been received at Kew from the Cape of Good Hope Government Commercial Agency, 73, Basinghall Street, London, E.C. :—

"I have taken the liberty of forwarding to you one box containing apples of various kinds, which have been grown in Cape Colony. You will notice that they are all disfigured with marks or spots, and I am informed by the apple judges that these marks prevent the fruit being of any commercial value.

"Would you kindly inspect them and give me all the information that you possibly can that will be of value to the fruit growers of Cape Colony, as to what the spot or fungus is ; what it is caused through, and what is the most effectual and cheapest remedy that can be employed in the Cape Colony to get rid of it.

"I have also sent a melon which has spots on it."

The subject has been investigated by Mr. Massee, Principal Assistant, Cryptogams, Herbarium, Kew.

Apple Disease.

The first evidence of disease is indicated by the appearance of minute, scattered, discoloured blotches on the skin ; these blotches are confined to the calyx or "eye" end of the fruit, or in other words, to that portion *not imbedded in the packing material* contained in the case in which the apples were stored. *The lower half of the fruit, imbedded in the packing material, remained in every instance perfectly free from blemish.* For several weeks

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the blotches continued to increase in size, ultimately attaining a diameter of about one-sixth of an inch, and at the same time becoming sunk or depressed below the general surface. When this stage is reached, if the apple is pared, a rust-coloured patch of flesh is found underlying each blotch. Microscopic examination showed the cells composing the rust-coloured patches to be dead and collapsed—hence the depressions—and crowded with starch grains, whereas the starch had entirely disappeared from the healthy cells in the process of ripening.

Neither fungi nor insects play any part in the disease under consideration, which is of a purely physiological nature, and in ordinary language may be stated to be due to irregularities in the ripening of the fruit.

To make this point clear, a brief explanation of the changes that take place during ripening, and the combined causes, is necessary. When an apple is fully grown and entering on the ripening period, it contains a considerable amount of malic acid and starch in its tissues. Of course the fruit is yet living and respiration continues, which results in the conversion of the acid and starch respectively into other substances, mostly sugar. During the end of the ripening period a certain amount of fermentation takes place, whereby a portion of the sugary mattter is converted into alcohol and volatile acids. By this means certain substances—ethers—are formed, which constitute the perfume or aroma of fruits.

It is important to remember that the rate of respiration or ripening depends almost entirely on temperature, and the amount of oxygen present in the air to which the fruit is exposed. When conditions are favourable for ripening, the malic acid is oxydised and disappears first, followed by the starch. When the temperature is high, the acid oxydises very quickly and fermentation commences, which often kills the cells and thus prevents further ripening. This is exactly what has happened to the fruit under consideration. Owing to excess of temperature during the early period of ripening, certain groups of cells were killed by fermentation commencing before the starch was converted into sugar, which resulted in the dead, rusty patches of flesh. Starch is most abundant near the periphery of the apple, and is almost absent towards the centre; this is why the rusty, dead patches always occur just under the skin.

On the other hand, when fruit is kept at a temperature not exceeding 35° F., ripening proceeds normally, as the acid is not oxydised sufficiently quickly to set up fermentation at too early a stage.

The relative amount of oxygen present in the air determines to a great extent the operation of ripening, as respiration depends on the presence of this element, and in some modern fruit rooms only a sufficient amount of oxygen is allowed to be present in the air to keep the fruit just alive, when the object is to retard the period of ripening. Judging from results already arrived at it would appear that the careful regulation of the supply of oxygen in the fruit room, will, in the near future, be the most important factor concerned in the process of ripening fruit.

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Summary.

The injury was due to the fruit being subjected to too high a temperature during the first period of ripening. Whether this occurred previous to, or during the voyage could not be determined.

The fact that the lower half of each apple that was buried in the packing material remained perfectly free from disease, suggests that if the fruit was completely covered with packing material so as to exclude the free access of air, no injury would be sustained.

Melon Disease.

When first received, small, roundish, pale brown patches were present in scattered groups on the surface of the rind. Diseased portions were removed and placed under conditions favourable for further development; the diseased patches continued to increase in size, changed to a dark brown colour, and became slightly depressed, and within ten days were covered with a minutely velvety blackish-olive mould, which proved on examination to be *Macrosporium sarcinula*, Berk., first met with many years ago on the rind of a gourd. At the present day it frequently occurs on imported melons, and appears to be widely distributed. The conidia or reproductive bodies of this black mould are produced in immense quantities, and are scattered by wind, insects, etc.; those that happen to alight on a young melon infect the fruit, and produce a new centre of disease, from which conidia are distributed in turn; hence, when once introduced, the disease spreads quickly unless preventive measures are promptly resorted to.

Experiments proved that the conidia of the black mould would also grow and produce fruit on different kinds of decaying vegetable matter; the conidia thus produced would also be capable of infecting young melons.

After the black mould has disappeared, a second form of fruit belonging to the same fungus is produced in the substance of the dead rind. The spores of this second form of fruit only germinate after a lengthened period of rest, and presumably, as in numerous other well-known instances, these resting-spores are dispersed and germinate about the time when the plant they attack is in full growth. Such spores would be the first to infect the young melons, and give origin to the black mould, which in turn continues the disease throughout the period of growth of the host-plant.

Summary.

Cleanliness, as in the case of every disease, is of primary importance. Decaying vegetable matter of every kind, so far as practicable, should be removed and buried. Diseased melons should not be allowed to rot and decay on the ground, otherwise a crop of spores will be produced which may result in disaster the following season.

On the first indication of disease the entire crop should be sprayed with a fungicide. The surrounding ground should also

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be sprayed. When the disease has existed previously, spraying should be done at an early period of growth, even if no disease is present.

The well-known Bordeaux mixture, half strength, might be used; or in its place a solution of sulphide of potassium (liver of sulphur) would also prove effective—sulphide of potassium, one ounce, dissolved in three gallons of water.

Fungicides act differently on foliage under different climatic conditions, and experiment alone can show the relative strength of the mixture that may be used without scorching the foliage or fruit.

XXXI.—EXPORT OF PARA RUBBER SEEDS.

The following valuable note by Mr. H. N. Ridley, of Singapore, is reprinted from the *Agricultural Bulletin, Straits and Federated Malay States*, Vol. V., No. 1 (1906):—

"As is well known, the seed of the Para rubber tree deteriorates very rapidly after it is ripe, and soon loses its germinating power. It is not always easy to send seed long distances without a very large percentage of losses; at the same time the demand for seed in distant parts of the world is very considerable, and a good many experiments have been tried in the Botanic Gardens in various methods of packing to ensure their arrival in good condition. The reports received from the recipients of these seeds have been remarkably good, as the following records will show—7,500 seeds sent to Jamaica on August 31st were received on 25th October, and Mr. Fawcett writes: 'The 7,500 seeds sent in biscuit tins are all germinating very well, and we shall scarcely lose 500 of them.'"

[With reference to this consignment Mr. Fawcett remarks in the *Bulletin of the Department of Agriculture, Jamaica*, Vol. IV., No. 7 (1906): "Over 87 per cent. of the seeds sown germinated, but some of the seedlings were constitutionally weak and died, so that only 5,071 plants survived, or about 68 per cent. of the seeds sown. A Wardian case arrived with 2,500 seeds, but only 18 plants were raised out of the whole number."]

"One hundred were sent in a similar manner to Calabar on the date July 6th, and arrived on September 20th. The Acting Secretary writes in reply: 'The seeds were soaked in water for two days on their arrival, and were then planted with the upper portion left above the soil. Ninety out of the hundred seeds have already germinated (November 7th), and appear healthy young plants.'

"To the Royal Gardens, Kew, 135 seeds were sent on July 6th, packed in charcoal in a biscuit tin. They arrived in a month, and 123 germinated. On February 12th, 1903, 20 seeds were sent to Mr. J. C. Harvey, Vera Cruz, Mexico, who writes, May 19th, 1903, that 'out of the 20 seeds of *Hevea brasiliensis* I have 14 young plants. They came up in a few days, and possibly a few more may germinate, though three seeds were decayed.' These were

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all sent in biscuit tins. Those sent to Jamaica were packed in slightly damped incinerator earth, but it was necessary to replace the upper part of the packing with sawdust to reduce the weight, as incinerator earth is very heavy, and the box, a two-pound tin which contained 150 seeds, would have been over parcel post weight.

"The other tins were filled with damp charcoal finely powdered. In packing a certain amount of care is required in damping the charcoal so as to get it equally moistened all through, and not either over wet or over dry. This is best done by damping the charcoal thoroughly, and then drying it in the sun, constantly stirring and turning it over till it is uniformly slightly damped. The incinerator earth, which had been exposed to the elements, was damped when received, and only wanted partial drying to fit it for packing. Its weight is against its use, but both it and the powdered charcoal have the great advantage of preventing any attacks of mould or bacteria likely to cause decomposition. Other experiments with powdered coir fibre and coir dust, sawdust, and variously prepared soils have been tried, but the results do not seem to have ever been as successful. One experiment was made in putting the seeds in water for a month, and, though that might be effective for a fortnight or so, they had all perished by the end of the month."

XXXII.—EAST INDIAN DRAGON'S BLOOD.

(*Daemonorops*, Spp.).

East Indian Dragon's Blood, a well known commercial article, is a hard resin obtained from the shells of the fruits of a number of species of climbing palms (Rattans) belonging to the genus *Daemonorops*. This genus includes about 80 species, but of these only a few, referred to the section *Piptospathae*, yield Dragon's Blood. Mr. E. M. Holmes, in the *Pharmaceutical Journal* for December, 1905, p. 833, has largely increased our knowledge of the botanical origin of this substance. More recently in the *Agricultural Journal of the Straits and Federated Malay States* for February, 1906, Mr. H. N. Ridley has still further added to the information available on the subject, which is summarised below.

The resiniferous species, from the various localities in which the substance is obtained, are as follows :—

Malay Peninsula.

D. didymophyllus, Becc. Common in forests in Singapore, Johor, Perak, Penang. This species has a stem about 12 feet long, and is known as Rotang Hudang and R. Butong, and is very abundant. The fruits are very rich in Dragon's Blood.

D. micranthus, Becc. Common in the Peninsula, occurring in Bukit Timah, in Singapore, Malacca, Johor, Negri Sembilan. The stem is 30 or more feet in length. The greater part of the resin from the Malay Peninsula appears to be afforded by this species. The young rattans are known in Johor as Rotan Tahi Ayam.

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D. propinquus, Becc. Found in forests in Singapore, Malacca, Selangor, Kemaman, Penang and Perak; also in Sumatra. A species closely resembling if not identical with *D. Draco*, Bl. Fruits usually covered with resin.

SUMATRA.

D. Draco, Bl. (*D. ruber*, Mart.). The Rotan Jernang of Sumatra. It grows to a height of 60 feet, and is as thick at the base as the forearm. This was described originally by Rumphius (*Herb. Amboinense*, V. 114) as the source of Dragon's Blood. He gives a long account of it, from specimens sent to him from Djambi and Palembang in Sumatra. He, however, confused it with *D. accedens*, Bl., with broader leaflets and more ovoid fruit, the *D. ruber*, Mart., a native of Java.

BORNEO.

D. Draconcellus, Becc. According to Beccari this is the Rotan Jerenang of the Dyaks. Found on Matang Mountain. The following Bornean species are also described by Mr. Ridley as resiniferous, viz. :—*D. mattaniensis*, Becc., *D. motleyi*, Becc., *D. sparsiflorus*, Becc., to which may be added *D. ruber*, Bl., of Java.

Of the above mentioned, *D. micranthus*, *D. propinquus*, *D. Draco*, and *D. Draconcellus*, are all known to the Malays as Rotan Jerenang, and are the source of the greater part at least of the Dragon's Blood of commerce. The remainder are probably also used, but we have no facts at present by which to settle this point.

For the subjoined particulars regarding the trade in Dragon's Blood we are mainly indebted to Messrs. Jenkin & Phillips, Mincing Lane, E.C.

The gum as it is known in commerce is imported in three forms (1) in lump or saucer, (2) in reeds, (3) in drop.

The lump or saucer Dragon's Blood comes from the Malay Peninsula in blocks weighing 7 to 14 lbs. done up in bags, and packed in cases of about 2½ cwts. It is shipped from Singapore, and varies very much in quality. It ranges in price from £6 to £10 per cwt., or may be considerably more according to the demand for the time being.

Reed Dragon's Blood is imported in sticks wrapped in leaves, usually those of a species of *Licuala*. This also comes from Singapore packed in cases. As a rule "reed" is not of so good a colour as "lump," though by some buyers it is the kind preferred. The present price is £8 15*s*. to £10 per cwt.

Drop Dragon's Blood consists of loose tears known as "Bombay Drop" or as "Zanzibar" Dragon's Blood. This kind is of very inferior quality, consisting chiefly of very dark gum of poor colour. Drop Dragon's Blood is generally imported in cases of 3 cwt. nett. Its value varies from 20*s*. to 65*s*. per cwt. The substance known

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as Drop Dragon's Blood is not derived from a *Daemonorops*; it is not indeed a product of the natural family *Palmaceae*, but is obtained from two species of *Dracaena*, *D. schizantha*, Baker, and *D. cinnabari*, Balf. f., respectively, nat. family *Liliaceae*.

Samples of these products are exhibited at Kew in Table-case C, Room No. I., and in Case 45, Room No. IV., in Museum No. II.

J. M. H.

XXXIII.—OGEA GUM.

(*Daniella* and *Cyanothyrsus*, Spp.)

In a letter addressed to the Royal Gardens, dated Lagos, April 13th, 1883, Captain (now Sir Alfred) Moloney, a valued correspondent of Kew, drew attention to this product. Accompanying the letter were herbarium specimens of an Ogea tree, together with a transverse section of the stem and samples of the resin.

This tree abounds in the Yoruba country, where it is known as Ogea, the Popo name being Ujea. It is generally found in swampy situations and is subject to the attacks of wood-borers, which readily cause the resin to exude. This is collected by the natives, who employ it for fires and for lighting, and as it is of a fragrant nature it is powdered and used by native women as a body perfume.

Samples of the hard fossilized resin or copal which had been dug from the ground were submitted to Mr. R. Ingham Clark, of the West Ham Abbey Varnish Works, Stratford, who found upon examination that they had a melting point of 420° Fahr., but that it required a heat of 600° Fahr. to melt them to a sufficiently liquid state to enter into complete partnership with linseed oil for the preparation of varnish.

The herbarium material forwarded by Capt. Moloney proves to belong to *Daniella thurifera*, Benn., described in *Pharmaceutical Journal*, Vol. 14, 1855, p. 400, but not to the species afterwards figured under this name in Hooker's *Icones Plantarum*, Vol, 25, t. 2406.

D. thurifera, Benn., is known as the Frankincense tree, and also as Bungo or Bungbo in Sierra Leone, where the fragrant resin obtained from it is sold in the native markets for use as incense and as a body perfume. A full and interesting account of this product by Dr. Daniell appeared in the *Pharmaceutical Journal* in the article referred to above, wherein also occurs a reference to Ogea. Recently further herbarium specimens of Ogea have been received from the Department of Forests and Agriculture, Lagos, which evidently belong to another genus, viz., *Cyanothyrsus*, which is nearly allied to *Daniella*. In this case the material sent is insufficient to name the plant specifically.

The Museum also contains other specimens of what is noted as Ogea Gum from Yoruba-land, the Gold Coast, and Southern

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Nigeria. All of these differ in character from the gums mentioned above. They are believed to be derived from one or more species of *Cyanothyrsus* so far undetermined. It is therefore much to be desired that further examples of these resins, together with complete herbarium specimens of the trees furnishing them, should be forwarded to Kew to enable them to be specifically determined.

A previous reference to this product was made in the *Kew Bulletin* for August, 1891, p. 207.

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XXXIV.—DECADES KEWENSES

PLANTARUM NOVARUM IN HERBARIO HORTI REGII CONSERVATARUM.

DECAS XLII.

411. **Astragalus brevidentatus**, *C. H. Wright* [Leguminosae-Galegeae]; *A. bolivianus*, Phil., quem simulat, calycis dentibus brevissimis differt.

Caulis procumbens, teres, pilosus. *Folia* circa 12-juga, dense sericea; foliola elliptica, obtusa, 6 mm. longa, circa 3 mm. lata; stipulae in unam oppositifoliam connatae, scariosae, acutae, 4 mm. longae. *Pedunculus* 4·4 cm. longus, pilosus; racemus 1·6 cm. longus; pedicelli vix 2 mm. longi; bracteae pedicellis paullo breviores, triangulares, scariosae. *Calyx* sericeus, 2 mm. longus; dentes brevissimi, subulati. *Corolla* lutea (?); vexillum obovato-lanceolatum, 1 cm. longum, 5 mm. latum. *Ovarium* sessile.

GALAPAGOS ISLANDS. Without collector's name, received from M. Decaisne, 1844.

Astragalus Edmonstonei, Robinson (*Phaca Edmonstonei*, Hook. f.), is synonymous with *Astragalus flavus*, Reiche (*Phaca flava*, Hook. et Arn.). The calyx of the latter is densely hairy, not "glabriusculus" as originally described.

412. **Gurania Eggersii**, *Sprague et Hutchinson* [Cucurbitaceae-Cucumerineae]; affinis *G. coccineae*, Cogn., foliis magis lobatis, calycis dentibus brevioribus, antheris rectis ab ea recedit.

Ramuli sulcati, sparse villosi. *Folia* pedatifida, ambitu suborbicularia, lobis 5 obovatis vel oblanceolatis (medio interdum trilobato), acute acuminatis basin versus sensim angustatis 9–15 cm. longis 3·5–7 cm. latis, margine denticulata, denticulis circa 0·5 mm. longis 0·5–3 cm. distantibus, membranacea, in venis utrinque villis puberula, ceterum glabra; venae laterales utrinque 7–8; petiolus 6–8 cm. longus, anguste alatus, costatus, sparse villosus vel glabrescens. *Flores masculi* 8–24 in racemum brevem corymbosum longipedunculatum dispositi; pedunculus gracilis, sulcatus, 15–17 cm. longus, glabriusculus; pedicelli sparse pilosi, usque ad 6 mm. longi. *Calycis tubus* ovoideus,

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circa 6 mm. longus, 2 mm. diametro, extra pilosus, intus glaber; lobi erecti, lineari-subulati, acuti, 2–2·5 mm. longi, extra sparse pilosi, intus glabri. *Petala* erecta, lanceolata, obtusa, 1·75–2 mm. longa, 0·75 mm. lata, dense papillosa. *Antherae* rectae, oblongae, circa 3·5 mm. longae, connectivo angusto, appendicula obtusa papillosa circa 0·4 mm. longa. *Inflorescentia feminea* rhachi angulato-flexuosa circa 25 cm. longa, floribus solitariis alternis 2·5–4 cm. distantibus, pedicellis usque ad 5 mm. longis. *Ovarium* subcylindricum, circa 2 cm. longum, glabrum. *Calyx* glabriusculus; tubus circa 1 cm. longus, 3–4 mm. diametro; lobi deltoidei, acuminati, leviter reflexi, 1·5–2 mm. longi, basi circa 1·5 mm. lati. *Petala* ovato-oblonga, obtusissima vel acuminata, 3–3·5 mm. longa, 1·75–2 mm. lata, dense papillosa. *Stylus* per 6 mm. indivisus, ramis intus stigmatosis circa 8 mm. longis 1·5 mm. latis apice rotundatis. *Fructus* desunt.

ECUADOR. *Eggers*, 15496.

According to Cogniaux's key to the species of *Gurania* (in DC. Monogr. iii. 679), *G. Eggersii* should come near *G. macrophylla*, *kegeliana* and *klotzschiana*, which agree with it in having *straight* anthers, narrow connective and papillate appendix, but the closest affinity seems to be with *G. coccinea* and *G. parviflora*, which differ from it in having the anthers *replicate* at the base.

413. **Gurania phanerosiphon**, *Sprague et Hutchinson* [Cucurbitaceae-Cucumerineae]; a vera *G. eriantha*, Cogn., corollae tubo insigni facile distinguitur.

Ramuli graciles, valde costati, ut pedunculi et longe patenter sparsiuscule villosi et pilis brevibus crispulis inter costas puberuli. *Folia* late ovata, acute acuminata, basi satis alte cordata, 11–16 cm. longa, 7·5–12 cm. lata, tenuiter membranacea, ciliata, minute denticulata, denticulis subulatis patentibus 5–10 mm. distantibus, utrinque breviter sparse appresse inconspicue villosa, basi pedatim 7-nervia; nervi laterales superiores utrinque 3; petioli circa 4 cm. longi, dense longe villosi, crispule pubescentes. *Inflorescentia mascula* spicata, longipedunculata; pedunculus circa 25 cm. longus; rhachis circa 3 cm. longa, dense villosa, minute crispule pubescens. *Calycis* tubus ovoideo-globosus, intus 6 mm. longus, circa 4 mm. diametro, extra dense villosus; lobi subulati, 16–18 mm. longi, basi 1·5–2 mm. lati, extra longe patulo-villosi, intus inferne villosi, superne glabriusculi. *Corollae* tubus 4–5 mm. longus, extra tomentellus, intus glaber; lobi lineares, subquadrangulares, obtusi, 8–10 mm. longi, 0·75 mm. lati, ubique pilis moniliformibus dense tomentelli, extra pilis longioribus formae solitae ornati. *Antherae* late ovatae vel ellipticae, 3–3·5 mm. longae, 2·5–3 mm. latae, inappendiculatae, loculis basi incurvatis, connectivo 1·5–2 mm. lato. *Planta feminea* ignota.—*G. eriantha*, Cogn. in DC. Monogr. Phan. iii. 683, *partim*, non *Anguria eriantha*, Poepp. et Endl.

ECUADOR. Forest near Archidona, *Jameson*.

414. **Peracarpa luzonica**, *Rolfe* [Campanulaceae-Campanuleae]; a *P. carnosa*, Hook. f. & Thom., foliis duplo minoribus, pedunculo folia saepissime multo excedente distincta.

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Herba subprostrata, ramosa, nana, 5–8 cm. alta. *Rami* graciles, glabri, subflexuosi. *Folia* petiolata, ovata, apiculata, crenata, 4–10 mm. longa, 3–7 mm. lata; petioli 2–6 mm. longi. *Pedunculi* graciles, 0·6–2 cm. longi. *Calycis* tubus 1 mm. longus, ovario adnatus; lobi triangulares, subobtusi, 0·5 mm. longi. *Corolla* alba, campanulata, 1·5 mm. longa, 5-partita; lobi lanceolato-oblongi, subobtusi. *Stamina* 5; antherae lanceolatae, 1 mm. longae; filamenta aequilonga. *Fructus* ellipsoideus, circa 3 mm. longus.

LUZON. Prov. Benguet: Mt. Data, at about 2220 ft., *Loher*, 3735; Pauai, at bases of trees in mossy forest, at 2040 ft., *Merrill*, 4724.

A very interesting addition to the Philippine Flora, as *P. carnosa*, Hook. f. & Thom., the only species hitherto known, is a native of the mountains of Northern India, from Kumaon to Sikkim, Khasia and Manipur, and has recently been detected in Yunnan by Dr. Henry. The Philippine plant is much smaller in every respect.

415. **Cynoglossum amabile**, *Stapf et Drummond* [Boraginaceae-Borageae]; affinis *C. furcato*, Wall., a quo floribus paulo maioribus amoene coeruleis, antheris altius insertis, nuculis magis erectis, glochidiis brevioribus basi saepe confluentibus recedit.

Herba perennis ad 60 cm. alta, undique griseo-pubescens vel hirsutiuscula. *Caules* teretes, infra inflorescentias simplices. *Folia* basalia in petiolum 1–2 cm. longum attenuata, lanceolato-elliptica, utrinque acuta, 5–10 cm. longa, 2–3·5 cm. lata, caulina sessilia, oblonga vel lanceolata, acuta, basi rotundata, saepe undulata, majora ad 10 cm. longa, ad 2·5 cm. lata. omnia dense tenuiterque molliter pubescentia vel subvelutina, nervis secundariis duplo arcuato-connectis subtus uti costa magis minusve albicantibus vel cinerescentibus. *Racemi* ex axillis foliorum sursum cito decrescentium superne in paniculam laxam collecti, inferiores pedunculis 2-foliatis, superiores pedunculis nudis suffulti ad 3 cm. (rarius ultra) longi, robustiores 2-pari; pedicelli sub anthesi vix 2 mm. longi, demum elongati (ad 4 mm.) et nutantes. *Calyx* ad 3 mm. longus, cinereo-pubescens; sepala ovata, subacuta. *Corolla* amoene coerulea; tubus ad 2·5 mm. longus; limbus patens, 7-9 mm. diametro, fauce fornicibus papillosis retusis instructus, segmentis rotundatis. *Antherae* inter fornices breviter protusae, 1 mm. longae; filamenta brevissima. *Nuculae* ambitu ovatae, in dorso depressae, oblique erectae, 3 mm. longae, 2-2·5 mm. latae, albicantes, ubique glochidiis brevibus basin versus incrassatis et interdum confluentibus obsitae, glochidiis marginalibus fere in cristam dispositis, gynobasi gracili inferne subito dilatatae adnatae, areola ovata in dimidio nuculae superiore sita.

CHINA. Yunnan, Mengtsze, *Hancock*, 133; Szemao, 1350 m., *Henry*, 9365. Szechuan, Tatsienlu, Soulié, 861; 2700–4050 m., *Pratt*, 887; without precise locality, cultivated and communicated by *Max Leichtlin*.

According to Hancock, this plant covers the plains near Mengtsze in large patches "absolutely blue, like lakes." A white flowering form was collected by Dr. Henry.

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416. **Euterpe Jenmanii**, *C. H. Wright* [Palmae-Oncospermeae]; *E. ventricosae*, C. H. Wright, proxima, caule minus ventricoso et fructu nigro differt.

Caulis erectus, 6–9 m. altus, leviter ventricosus. *Foliorum* rhachis triangularis, laevis; foliola lineari-lanceolata, acuminata, 75 cm. longa, 2·5 cm. lata, nervis circa 10 tenuibus. *Panicula* dense ramosissima; ramuli ultimi teretes, glauci, floribus dense vestiti. *Flores* ♂ : sepala subreniformia, imbricata, 1 mm. longa; petala oblongo-lanceolata, 4 mm. longa, 2 mm. lata; stamina 6; filamenta compressa, petalis aequilonga; antherae dorsifixae, sagittatae; ovarii rudimentum parvum, trilobum. *Flores* ♀ : sepala valde imbricata, transverse oblonga, 1·5 mm. longa, 3 mm. lata, scariosa; corolla 3·5 mm. longa, lobis 3 triangularibus acutis valvatis tubo aequilongis; staminodia connata, corollae tubo adnata, lobis triangularibus obtusis; ovarium oblique ovoideum; stigma excentricum. *Drupa* globosa, 8·4 mm. diam., exsiccata nigra.

BRITISH GUIANA. Georgetown, *Jenman*, 2057.

417. **Euterpe ventricosa**, *C. H. Wright* [Palmae-Oncospermeae]; *E. acuminatae*, Wendl. (*Œnocarpi utili*, Klotzsch), affinis sed ramis, ultimis inflorescentiae teretibus glaucis, florum masculorum sepalis multo minoribus suborbicularibus.

Caulis erectus, 6-9 m. altus, medio ventricosus circa 7·25 dm. diam. *Foliorum* rhachis triangularis, glabra; foliola oblongo-lanceolata, ad 12 dm. longa, 4·4 cm. lata, circa 12-nervia. *Spadix* ramosissima; ramuli ultimi 2·25 dm. longi, 2 mm. lati, teretes, glauci, floribus dense vestiti. *Flores* ♂ : sepala suborbicularia, imbricata, 1 mm. longa; petala oblonga, subacuta, valvata, 4·7 mm. longa; filamenta petalis breviora, compressa; antherae dorsifixae, cellulis basi divergentibus; ovarii rudimentum parvum, trigonum. *Flores* ♀ : sepala late deltoidea, obtusa vel nonnunquam mucronulata; corolla trilobata, 3 mm. longa; lobi late triangulares, tubo dimidio breviores; staminodia 6, connata, corollae tubo adnata, lobis rotundatis; ovarium oblique ovoideum. *Drupa* globosa, 6·3 mm. diam., brunnea.

BRITISH GUIANA. Cultivated in the Botanic Gardens, Georgetown, *Jenman*, 7574.

418. **Dichelachne brachyathera**, *Stapf*, [Gramineae-Agrostideae]; affinis *D. sciureae*, Hook. f., sed spiculis minoribus, glumis magis inaequilongis, arista multo breviore, antheris brevibus diversa.

Gramen caespitosum, perenne, glabrum. *Culmi* graciles, 4-nodi, internodiis e vaginis exsertis. *Foliorum* vaginae subarctae vel summa superne dilatata, magis minusve asperulae; *ligulae* membraneceae late ovatae, 3 mm. longae; laminae lineares, apice longe acutatae, acutissimae, inferiores ad 35 cm. longae, ad 7 mm. latae, planae, virides, scaberulae, nervis lateralibus (secundariis) utrinque 3. *Panicula* contracta, linearis, 15 cm. longa, paulo ultra 1 cm. diametro; internodia inferiora 3–2 cm. distantia; rami fasciculati, 5–3-nati, valde inaequales, longiores ad 5 cm. longi et ad 8 mm. indivisi, breviores ab ima basi divisi; ramuli (rami secundarii) fasciculati, ad 1·5 cm. longi, racemosi; pedicelli 1·5-0·5 mm. longi. *Spiculae* lanceolatae, 4–5 mm. longae,

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viridescentes. *Glumae* anguste lanceolatae, acute tenuiterque acuminatae, praeter margines albido-hyalinos virides, carina asperula, inferior paulo brevior, 1-nervis, superior 3-nervis. *Valva* lanceolata, acutissima, minute bifida, glumam superiorem subaequans, circiter 1 mm. infra apicem aristata, minutissime asperula, 5-nervis, nervo exteriore submarginali, ima basi (callo) minute barbata; arista 4–5 mm. longa subflexuosa a medio magis minusve recurva. *Palea* tenuis, 2·5–3 mm. longa, carinis superne asperulis. *Antherae* late oblongae, 0·5–0·7 mm. longae. *Stigmata* delicate plumosa, 1–1·5 mm. longa.

AUSTRALIA. New South Wales: Blue Mountains, Mt. Wilson, swamp at the head of Waterfall Gully, *Gryson*.

Diandrolyra, *Stapf*, gen. nov. [Gramineae-Olyreae]; ex affinitate *Olyrae*, sed differt spiculis geminatis inferiore feminea, superiore mascula distincta; spiculis masculis glumis 2 praeditis in inferioribus minutis in terminali valvam aequantibus; flore masculo 2-andro cum pistillo rudimentario bene evoluto; flore femineo cum staminodiis minimis 2.

Spiculae unisexuales, praeter summam masculam geminatae, inferior uniuscuiusque paris feminea, superior mascula, in racemum compositum spiciformem dispositae. *Spiculae masculae* cum pedicello articulatae, totae deciduae, ramulorum ovato-lanceolatae; glumae minutae, squamiformes, minutissime puberulae, hyalinae; valva membranacea, tenuiter 3- vel sub-5-nervis, parce transverse venulosa; palea quam valva paulo brevior, 2-carinata; lodiculae 3, carnosulae; stamina 2 (anticum suppressum); pistilli rudimentum perfecto simili sed basi tenui, stylo indiviso, stigmatibus confluentibus; spicula mascula terminalis lanceolata; glumae magis minusve aequales, valva vix breviores, 3-nerves, caetera ut in spiculis ramulorum. *Spiculae femineae* cum pedicello articulato si haud fecundatae totae deciduae, ovoideo-oblongae, breviter cuspidato-acuminatae, virides, puberulae; glumae herbaceae, aequales, valvam paulo superantes, sub 7-nerves, transverse venulosae, basi cum rhachilla in stipitem brevem crassiusculum connatae; valva oblongo-elliptica, acuta, pergamentacea, demum indurata, pallida, tenuissime 5-nervis, laevis; palea 2-nervis, valvam aequans et structura simillima; lodiculae 3, truncatae, carnosae; staminodia 2, minutissima, cylindrica, lateralia (anticum nullum); ovarium ovoideum in stylum filiformem apice divisum abeuns, stigmatibus plumosis sub apice anthoecii exsertis. *Caryopsis* ellipsoidea, libera; *Embryo* minutus.

419. **D. bicolor**, *Stapf* (spec. unica).

Gramen perenne, dense caespitosum. *Culmi* erecti, tota fere longitudine vaginati, parte terminali exserta pubescente florentes 1–3- (rarius pluri-) foliati 4–8 cm. alti, steriles 5–8-foliati, 10–20 cm. alti. *Folia* infima ad vaginas redacta, sequentes perfecta vel 1–2 intermedia (*i.e.*, lamina parva ovata); vaginae arctae, striatae, tenuiter puberulae nisi superne pubescentes vel partibus obtectis glabris, ore obtuse subauriculatae vel truncatae; ligula vix ulla; lamina lanceolata vel lanceolato-oblonga, basi rotundata, abrupte in petiolum 1 mm. longum pubescentem contracta, 6–9 cm. longa,

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1–1·5 cm. lata, apice tenuiter acutata, plana, supra saturate viridia, costa basi calloso-incrassata supra tenui percursa, tenuiter striata, laevis nisi secundum margines asperula, infra violaceo-purpurea, asperula, nervis secundariis utrinque 3 prominulis, venis transversis nullis. *Inflorescentia* terminalis, 1·5 cm. longa, angusta, subsecunda, folio summo superata spicularum paribus 4–5; ramuli adpressi, ad 3 mm. longi, uti rhachis semicylindrica, sublaeves vel superne asperuli. *Spiculae masculae* 5 mm. longae, inferiorum gluma inferior 1–1·5 mm. longa, lanceolata vel ovata, magis minusve acuta, superior minor; antherae vix 1 mm. longa; pistillum rudimentarium antheras paulo superans. *Spiculae femineae* 6 mm. longae; valva 5 mm. longa, laevissima.

Native country unknown. Raised at Kew from seeds communicated by Messrs. Sander & Son.

The blades of vertical stems are more or less at right angles to the medium plane, of inclined stems more or less inclined, and if more than two or three, distinctly distichous. The uppermost blade is obliquely erect and more or less in the continuation of the stem with the inflorescence facing the green upper side. When the fruits have begun to set, the blade of the uppermost leaf turns on the petiole until it has come round the inflorescence so that its purple underside faces the fruits. As the leaf-margins curl back at the same time the infructescence becomes loosely enclosed and hidden by the blade.

420. **Selaginella (Stachygynandrum) Tansleyi**, *Baker* [Selaginellaceæ]; ad *S. plumosam*, Baker, magis accedit; differt caule parce ramoso, foliis majoribus haud contiguis ovatis basi haud ciliatis, foliis minoribus conspicue aristatis, bracteis obtusis.

Caules continui, decumbentes, remote ramosi, subpedales, ramis ascendentibus brevibus simplicibus vel breviter ramosis. *Folia majora* ovata, nitidula, viridia, 2 mm. longa, ad latus superius magis producta, basibus haud ciliatis utrinque late rotundatis. *Folia minora* ascendentia, ovata, conspicue aristata, foliis majoribus duplo breviora. *Spicæ* 12–18 mm. longae, 2 mm. diam.; bracteae erecto-patentes, conformes, obliquae, ovato-lanceolatae, obtusae.

MALAY PENINSULA. Perak or Selangore, *A. G. Tansley*.

XXXV.—SYDNEY BOTANIC GARDENS.

Mr. J. H. Maiden, Director of the Sydney Botanic Gardens, has given in the *Sydney Morning Herald* an interesting and very valuable account of the origin of the Gardens and of their history during the early half of the last century. The first instalment of this sketch appeared in the issue of the journal for April 21; it was concluded in the issue for May 23, 1906. With the object of rendering it more generally known, the sketch is reprinted here. The history of the Gardens subsequent to January, 1848, the date to which present account brings us, which Mr. Maiden hopes at some future date to write, will be looked forward to with much interest.

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"Sydney Botanic Gardens.

"If it be stated that the Botanic Garden of Sydney is one of the eldest in the world, it may be thought to be harmless exaggeration. That of Oxford is older, Kew is older, some of the older Italian gardens have been styled Botanic, and have done botanical work fitfully. But Sydney is senior to that of Cambridge, Edinburgh, all the official American gardens, and many others. Furthermore, as a combined botanical and horticultural establishment that of Sydney is, by common consent, admitted to the front rank of the world's institutions.

"It has grown with New South Wales, and its growth has been so gradual that a certain amount of research has been necessary to ascertain certain facts in its development.

"The colony was founded on January 26, 1788. Governor Phillip had collected both at Rio de Janiero and at the Cape many economic plants, while he had brought wheat and other cereals from England. Simultaneously with finding shelter for his people he set apart land for a farm and garden. This was the site of the present Botanic Garden and the origin of the name Farm Cove, on which it abuts.

"The creek which runs through the Garden and which is made as rural as possible under the circumstances, is the stream marked on Governor Phillip's first plan, and doubtless was the cause of the farm being chosen where it is. His first plan is marked 'a farm, nine acres in corn,' and six months later we have the note, 'six acres of wheat, eight of barley, and six of other grain.'

"Some time after 1790 the Governor gave Nicholas Devine a permission occupancy of a portion of land at Farm Cove, and there is a notice in the 'Sydney Gazette' in 1803 regarding a theft of 'apple-tree plants' from this early horticulturist.

"The 'Scotch Martyrs,' Muir, Palmer, Skirving, Gerald, and Margarot, were transported for what we should at the present time call the expression of moderate political opinions. This was in 1794. Gerald purchased or leased a piece of land in the Botanic Gardens, built a house and formed a garden, where he died in March, 1796. Tradition has it that he was buried in his garden, between the wishing tree and the creek, but I have no evidence, and the precise site is unknown.

"In the earliest days the farm or garden was primarily to replenish the Government stores with grain, and also to supply the Governor and the officers with fruit and vegetables. At least as early as 1806 it was alluded to as the Government Garden. By this time British oaks had fruited in the infant colony, and 'the gardener will have instructions to supply those who may be approved.' So that a century ago the place had become differentiated from a farm into a garden. The fact is that partly because of the innate sterility of the land, and partly because the cereal crops were attacked by rust, it became impossible to cultivate these necessities of life at Farm Cove, which accordingly were

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grown at Parramatta and the Hawkesbury. But the impress of the old ploughed fields is still left in the Botanic Gardens in the shape of the large oblong beds which, at the present day, mainly compose the Middle Garden. These were simply wheat and barley fields and vegetable gardens, and when the farm evolved into a garden it was sufficient to make paths parallel to and at right angles to the old furrows. After the cereals had disappeared, vegetables, small fruits, and orchard succeeded, and the wishing tree was planted (in 1817) at the intersection of paths.

"The attention that had been given in Europe to the remarkable vegetation of New Holland caused the directors of botanical establishments and proprietors of nurseries to compete eagerly for seeds and plants of this country. Sydney had practically a monopoly of such productions, and hence it came about that cases of plants were consigned to the Botanic Gardens of Sydney by almost every ship. Economic plants were most sought for in Sydney as an exchange, but other interesting and beautiful plants poured in. The early superintendents (as they were then called) endeavoured to set out the plants they received, according to methods of classification, but the variety was such that this grouping had to be abandoned. At the present day, however, the horticulturist or botanist can still see, for example, how the Oleaceae (Jasmine or Olive family), the Araliaceae, the Sterculiaceae were planted together in those early days.

"Governor Bligh was fond of gardening. We read that in 1807 'the shrubbery has also undergone a thorough change—no grass now growing in it, all laid out in walks, with clumps of trees.' Government House was then at the corner of Bridge and Phillip streets, with a fronting to Farm Cove. The solitary remaining tree of the old Government House avenue of a century ago is an oak in Phillip Street, opposite the Civil Ambulance Brigade, near the Water Police Court. The telegraph people hack at it every now and then, and this (perhaps the oldest) relic of the Government Garden in Sydney, should be placed in my charge before it is too late. There used to be ten or a dozen stone pines just west of old Government House; one of them stood in Bridge Street up till about 30 years ago.

"At this time, in a map by Meehan (assistant surveyor), the native name of Farm Cove is given as Woccanmagully. This map showed leases in the present Botanic Gardens, in addition to Devine's, but these were shortly afterwards revoked.

"Howard, the friend and executor of Allan Cunningham, later on King's Botanist, and afterwards Superintendent of the Botanic Gardens, informed Hooker that the Sydney Botanic Garden was 'probably founded shortly after Governor Macquarie's arrival in 1809,' but I will show presently that a somewhat later date is the correct one.

"In the year 1813 the Mrs. Macquarie's Road, referred to in the inscription on Mrs. Macquarie's Chair, was commenced. This road was of a total length of three miles and 37 yards, probably measured from the Obelisk in Macquarie Place. The road encircled the Domain, as then defined, and from the chair to old

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Government House gates it passed through the present garden, *e.g.*, from the vicinity of Mr. Overseer Camfield's present house, along the north side of the old stone wall. The old stone wall had therefore been constructed some time prior to the year 1813—I do not know the precise date. Mrs. Macquarie's Road was finally completed on June 13, 1816. Besides the chair, the inscription 'Mrs. Macquarie's Road, 1816,' may still be seen on a rock on the left-hand side of the road up the slope after leaving Palmer's baths.

"The completion of Mrs. Macquarie's Road and its record on the chair was, I consider, the coping-stone of Macquarie's plans for the definition of the Garden and Domain. He then appointed a superintendent to supervise the area which he had thus defined.

"Mrs. Macquarie's chair is, therefore, the true foundation-stone of the Botanic Gardens; the date (June 13, 1816) inscribed on it is the official birthday of the Botanic Gardens. In about 10 years, therefore, we shall arrive at the centenary of the Sydney Botanic Gardens, and I hope that one way of commemorating it will be by the issue of an illustrated historical volume.

"Incidentally, I may remark that 1816 is an important year to us for another reason, since on December 21 Allan Cunningham landed in Port Jackson.

"Part of Mrs. Macquarie's Road is lined by swamp mahogany trees (Eucalyptus robusta). These line the north side of the wall from the aviary entrance to the main avenue entrance.

"Other trees along this Macquarie Road are the British oaks, from the main Domain entrance opposite the Public Library along the back of the hospital wall, at least as far as the St. Mary's entrance to the Domain.

"It is stated that these trees were planted by a Mr. Bigg, of Governor Macquarie's orders; and the story goes that Bigg, having a number of oaks to plant, had one over, and planted it in front of his house in Phillip Street. This was the tree growing in the path in front of the office of the Inspector-General of Police for so many years, and cut down while in full vigour only a few years ago. Messrs. Charles and George Kellick, who were born in Phillip Street, obtained the history of these plantings from their father, who knew Bigg well.

"In 1816 the first Superintendent of the definitely constituted Botanic Garden, with the title 'Colonial Botanist,' was appointed by Governor Macquarie in the person of Charles Fraser, a soldier of the 46th Regiment, who in the following year went with Allan Cunningham to collect plants and seeds on Surveyor-General Oxley's journey of exploration to the west.

"Let me digress for a moment. It is the fashion of Sydney people to speak of the Botanic Gardens in the plural, and this is how it came about:—The original garden, which we now know as the middle garden, was bounded on the north by the picturesque old stone wall, on the east by the aviary, on the south by the hothouse avenue, and on the west by the creek. The upper garden was formed partly by taking in land from the Domain and

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partly by absorbing the site of the old house and grounds of the director. The lower garden was formed by enclosing and bringing into cultivation that portion of land between the middle garden and Farm Cove.

"In the year 1817 Mrs. Macquarie had a Norfolk Island pine (raised from seed by Major Antill, it is stated) which had got too large for the gubernatorial garden. She gave orders for it to be planted in the Government or Botanic Garden. It was placed in the middle or intersection of paths of the middle garden, and forms what is now known as the 'Wishing Tree.' Said designation was given because the custom grew up amongst the damsels of Sydney of walking three times round this tree when all their wishes would be gratified, and they would be happy.

"The tree is about 100 ft. high, and it would appear to have now reached its maximum growth. Quite a number of candidates have claimed the honour of planting that tree. The late Mr. J. M. Antill stated that his father, Major Antill, 73rd Regiment, Aide-de camp to Governor Macquarie, planted it. Mr. Charles Fraser, the Superintendent of the Garden, is also credited with this honour. Ned Shakeley, a prisoner, afterwards employed by Mr. J. Baptist in his gardens at Surry Hills, was also stated to have been the planter; and a friend of mine told me that Mr. John Higgerson (the well-known Assistant Ranger of the National Park, who died last year), told him that he 'had a hand' in planting this tree. Now, I propose to adjust these claims in the following manner:—Ned Shakeley dug the hole, Johnny Higgerson handed him his spade and helped him generally, Mr. Fraser turned the plant out of the pot to see that it was all right, and Major Antill planted it with due ceremony. Then Mr. Fraser trod the earth about it, staked it, watered it, and tended it during its early days. And I have no doubt that the irascible Governor Macquarie, when the tactful Mrs. Macquarie had got him into one of his good humours of which tradition speaks, said one day:—'And now we will go and see that little pine, my dear, which Antill tells me he has planted.'

"The 'wishing tree' is the most historically interesting plant in our beautiful Garden. Considering the rich soil which such pines require in their native Norfolk Island, its development in such a sterile situation affords a remarkable example of adaptability to environment. I often stand at that spot, contemplate Macquarie, and think of the marvellous changes around me in the Garden in the course of less than a century!

"Tradition states that Fraser, who was known to have a good knowledge of horticulture and a scientific acquaintance with botany, acquired his knowledge in some of the best establishments in Scotland. His various explorations in New South Wales, Queensland, and Western Australia in the first decades of the last century enriched these Gardens with many notable plants.

"The five voyages, which included the circumnavigation of Australia undertaken by Captain P. G. King, R.N., in the twenties, with Allan Cunningham as King's Botanist, was the means of introducing to Sydney many Australian plants not previously in

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cultivation. The many journeys of exploration undertaken by Allan Cunningham resulted in fine collections of fruits and seeds being brought to Sydney.

"During the year 1827 we find quite a crop of notices in the *Sydney Gazette* concerning the Botanic Gardens. It is announced that a pitcher-plant (Cephalotus) had been discovered at King George's Sound, and that specimens are in the Botanic Gardens. That the gates are to be closed except to the military (September 26). That an olive tree six years old was bearing flowers; and that cotton grown in the Gardens was sent to Glasgow (presumably to the elder Hooker, for report). A list of fruits cultivated in the Sydney Botanic Gardens was published in the *Gardeners' Magazine* of London of that year.

"The Sydney Botanic Gardens have, apart from their aesthetic and hygienic aspects, been intimately bound up with the material welfare of the colony. The establishment has a most honourable record of service in regard to the introduction of useful plants into Australia. Much of this work has, of course, been rendered for many years unnecessary by reason of the establishment of so many reputable firms of seedsmen and nurserymen. The Sydney Botanic Gardens has also laid the foundations of the grand work now undertaken by the Departments of Agriculture of the various States, much of it, of course, entirely beyond the scope of a modern botanic garden. The Sydney Botanic Garden is classic ground. Its area includes, as has already been shown, the site of the first farm, where corn was grown for the infant colony, where fruit trees of all kinds—apples, oranges, olives, vines, bananas—were first acclimatised, where it was shown that the cotton and innumerable economic plants could grow in New South Wales, while by means of Wardian cases and glasshouses, it was the means of establishing and propagating valuable tropical economic plants for what is Queensland, Northern Australia, and Polynesia; such plants were chiefly obtained from the islands of the Pacific, Batavia, Calcutta, and London. The methods and objects of the Sydney Botanic Gardens have changed with the necessities of the times, but I say, without fear of successful contradiction, that the institution now more deserves the title of 'botanic' than at any other period of its existence.

"Not only was the Sydney Botanic Garden engaged in the propagation and exchange of plants, but seeds, cuttings, rooted plants, etc., were extensively supplied in the late twenties to 'Brisbane Town.' Plants so propagated were not only distributed to public institutions, but to such private and official persons as the Governor might see fit to direct.

"In the year 1828 (July 11), Fraser was addressed by the Colonial Secretary as the 'Superintendent, Botanical Garden.' They were rather easy-going in those days, and he was officially designated indifferently in addition 'Colonial Botanist,' and sometimes 'Superintendent, Government Garden.' On one occasion he signs himself 'H. M. Bot. Collector.'

"On June 8, 1829, the *Sydney Gazette* contained an official description of the Domain and Botanic Gardens, from which it will

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be seen how much less in area the Domain is now to what it formerly was. I may mention that in the year 1811, Garden Island was declared to be a portion of the Domain.

"In 1829, the Garden was more accurately defined than heretofore, additions were made to it, and the whole fenced. A plan of the Garden at this period is in existence.

"During 1830 the experiment was tried of employing orphan boys (in care of the State) in the Botanic Gardens, but it was not a success, and the experiment came to an end in three or four years.

"In July of this year, Mr. Fraser made the first annual report of which I have any record. The operations were even then of some magnitude, cases of seeds and of living plants being sent to a number of Botanic Gardens in various parts of the world, and also to certain distinguished individuals. Of herbarium specimens the Regius Professor of Botany (W. J. Hooker), at Glasgow, was the principal recipient, and he received 1,800.

"In May of this year it was announced that Mr. Fraser had a cutting of the weeping willow which grew over Napoleon's tomb at St. Helena, and that it was planted on one of the miniature islands constructed by him in the pond in 'the new botanic gardens which he is laying out at Farm Cove.' I believe this island to be that on which Cunningham's monument stands, and the willow in question may be that on the bank just to the north of the island. At all events, all the weeping willows in the vicinity of this pond and most of them in other parts of the Garden are descendants of Napoleon's willow.

"The laying out undertaken by Fraser refers to the land outside the stone wall which bounded the existing garden (which is now known as the middle garden) and the sandy beach (as it was then) of Farm Cove. This new area, now known as the lower garden, was laid out by Fraser, and there is a plan in existence, signed by Major Mitchell, the Surveyor-General, in 1833, showing that the laying out was practically as it exists at the present day. In those days the tide used to come up to near Cunningham's monument, but in 1869–70 the land between tides was reclaimed, and the substantial semicircular stone wall which exists round Farm Cove was erected.

"Fraser's alterations, instigated by the Governor, were very considerable, and were in progress in 1830–1.

"A new walk approved by his Excellency was 1,600 yards in length. 'The above distance will admit a walk through the centre on high ground from its southern to its northern extremity, passing over the carriage road at Mrs. Macquarie's Chair, and entering the bush on the western side of the road. It will then meander through those Roman rocks facing Farm Cove, and command a view of the town, stables, both forts, and in clear weather the Blue Mountains. A private walk will enter the new garden at its northern extremity.' (This gate is still in existence. It connects the middle and lower gardens at the main avenue, and is covered with creeping fig.)

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"On 20th August, 1831, Mr. Fraser informed the Colonial Secretary that 'the roads in the Government Domain are now made passable for two carriages.' Then comes the important official announcement, dated September 9, which marks an epoch in regard to the utilisation of the Domain :—

"His Excellency the Governor has directed that it be notified that 'the grounds in the Government Domain, near Anson's Point (Mrs. Macquarie's Chair) have been laid out in walks for the recreation of the public ; and that the Domain will be opened for carriages on Tuesday next, the 13th inst.

"The road from the stairs near Fort Macquarie along Farm Cove to the gate which crosses the road at the extremity of the Botanic Garden is reserved for the exclusive accommodation of persons on foot.

"Carriages and horsemen may enter the Domain at the gate near the School of Industry, or at the Woolloomooloo gate at the southern boundary of the Domain.

"This was the birth of the Domain and its use practically as we know it to-day.

"The same year, 1831, was memorable from the visit of Mr. James Busby to the wine-growing districts of Europe, to select vines likely to be useful in New South Wales. From the Botanic Gardens of Montpelier, France, he obtained no less than 433 sorts, and from the Luxembourg Garden at Paris, 110 sorts. These were transmitted to the colony in the following year, and on January 22, 1833, it was recorded that '362 varieties were alive and for the most part healthy,' in the Botanic Gardens, Sydney. Thus began, in earnest, the wine-growing industry of New South Wales. Busby's vines were planted east of the creek, and in the vicinity of the present hot-houses. For about 25 years they served to propagate vines all over the colony, and this historic vineyard, or rather assemblage of vines, having served it purpose was finally uprooted about 1860. Mr. L. Woolf, then an employé of the Botanic Gardens, and who still retains his interest in horticulture, remembers these vines perfectly, and has given the present writer information concerning them.

"The year 1831 is also memorable, in that Charles Fraser, the first Superintendent of the Botanic Gardens, died on the last day of it. He was undoubtedly a worthy and an able man, and I regret that no portrait of him appears to have been preserved."

"On Fraser's death Allan Cunningham declined the appointment. His brother Richard, then at Kew, was recommended by Robert Brown, and also by Aiton, of Kew, and he was accordingly appointed by the Colonial Office.

"After the special activities of 1831 and absence of a superintendent (Mr. John M'Lean performing duties in the interim), no events of a noteworthy character took place during the year 1832.

"In January, 1833, Richard Cunningham entered on the superintendence of the Botanic Gardens with an earnestness and zeal which furnished good evidence of his having the improvement of the establishment, in its several departments of botany and horticulture, strongly at heart. An experimental ground was

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formed in which the cultivation and propagation of vines and fruit trees generally were attended to, and from which the colonists received ample supplies of cuttings. In the botanical division some improvements were made, and many of the rarer indigenous plants were brought in from remote localities that had not previously found a place in the garden; while numerous exotics, adapted to the soils and climates of the colony, were introduced.

"During this year he went to New Zealand in a man-of-war in order to assist in the selection of suitable spars for the use of the Royal Navy. He maintained very friendly relations with the Maoris, and returned to Sydney laden with plants.

"On July 13 he furnished a report to the Governor containing details of his plans of his improvements, which can be more fully understood by reference to a plan by the Surveyor General (Major Mitchell) executed during the same year.

"During the second half-year we find that 120 of the Busby vines were bearing fruit, and that 1,000 ornamental plants and 1,200 fruit trees, 'exclusive of about 500 olive layers and a vast number, not counted, of grape vines, plants and cuttings . . . seeds of culinary vegetables were distributed in considerable quantities among such persons as applied for them.'

"1834 seems an unevenftul year, the only breeze to cause a ripple being the conduct of a wicked man named Still, whose conduct was not as calm as his name would indicate. He put horses in the 'newly-made plantation leading to the Domain, and entirely destroyed it.' Mr. Still 'said he would send as many horses as he thinks proper to destroy the young trees,' and so the matter was referred to the Colonial Secretary.

"During the year Richard Cunningham zealously attended to the requirements of the garden, and made numerous journeys into the country for the purpose of making himself acquainted with its flora and of collecting seeds and young plants for cultivation.

"We now reach the year 1835. In those days official letters were laboriously copied, copying ink not having been invented. The last letter Richard Cunningham copied in the letter book was dated February 23, and referred to instructions he had received from the Governor to attach himself as botanist to the Surveyor-General's (Major Mitchell's) expedition of exploration to the West.

"What happened soon can best be stated by transcribing a memorial tablet in St. Andrew's Scots Church, Sydney:—

> "'Richard Cunningham, Government botanist to the colony, attached to an explorative expedition into the interior, under the command of Major Mitchell, Surveyor-General, wandered in his enthusiasm for botanical investigation, from his companions, and losing himself in the desert country on the Bogan River, fell into the hands of one of the native tribes, by whom he was unfortunately killed about April 25, 1835, in the 42nd year of his age. This tablet is erected as a lasting and affectionate tribute to his memory by Allan, his only brother.'

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"The few fragments of his remains were collected by Lieutenant Zouch, of the Mounted Police, and buried at Lower Tabratong, near Dandaloo, where a stone marks his last resting place. The grave is on Hunt Brothers' Burdenda station.

"Thus passed away a martyr to science, one whose usefulness to the colony was only just beginning to fully expand, and one who appears to have been endowed with a singularly agreeable disposition. His scientific reputation has been largely overshadowed by that of Allan, his distinguished brother. It is, of course, impossible to say in what direction Richard, had he been spared, would have made an impression on the Botanic Gardens, and on the botanical investigation of the colony, but we are perfectly justified in saying, from what he accomplished, that his early death (followed as it was so soon by that of his brother) was a blow from which botanical investigation in Australia never recovered till Bidwill's time.

"During 1836 we find that that portion of the Domain between Macquarie Street North and Macquarie Place was alienated primarily with a view to raise funds to build a new Government House, as the Imperial Government was not disposed to incur the necessary expense.

"In this year a committee was appointed to test Busby's vines. James Backhouse, the visiting Quaker philanthropist and botanist, was a member of it, and he writes:—'A large proportion of them are wine grapes, but most of the varieties cultivated for the table in England are among them under their French names.'

"The vacant post of superintendent of the Botanic Gardens was offered to Allan Cunningham. He had refused it some years previously, and was at work at Kew on his Australian plants, when the offer was again made to him on his brother's death.

"Two circumstances combined caused him to accept it. One was that he longed to again investigate the Australian flora on the spot, and the other was that on his long and arduous journeys of exploration his health had so suffered, that he thought a sea-voyage and an exchange to the Australian climate from that of Kew would be beneficial to him. He sailed for Sydney in October, 1836.

"This is not a sketch of Allan Cunningham's life, but of the early history of the Botanic Gardens, and I will content myself therefore with briefly touching upon his connection with the gardens.

"He arrived on February 12, 1837, and in the *Government Gazette* of March 1 his appointment as Colonial Botanist and Superintendent of the Botanic Garden was announced.

"During the interregnum the Governor had appointed a committee of management, and this was unknown to Allan Cunningham when he accepted the post. Its appointment formed one of the reasons why the distinguished botanist and explorer threw up his position. The committee continued to act during the stop-gap administration of overseer Kidd. When Mr. Charles Moore arrived, friction speedily arose, he being a strong man, and

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objecting to the interference of the committee in the details of management. A Parliamentary inquiry was held, and the committee, which had met but little of recent years, finally vacated office in 1855.

"Cunningham also made up his mind to resign his appointment in consequence of duties having been imposed upon him which he considered incompatible with his position. He particularly resented having to cultivate vegetables for certain civil and military notables, and the *Sydney Herald* of the time supported him in the stand he took.

"In the early part of December he sent in his resignation to the Governor (Sir Richard Bourke). Colonel Snodgrass, the Lieutenant-Governor, asked him to furnish a report on the state of the garden for the information of the incoming Governor. This he did, and his report is still in existence. He then determined to visit New Zealand on a purely scientific expedition. On January 15, 1838, this gentle spirit wrote to England the only angry letter I ever knew him to pen. He said: 'Tell all, I have discharged the Government cabbage garden in disgust, and am now to enter with all my might, mental and corporeal, on a more legitimate occupation for a few months.'

"By request, and as an act of courtesy to the incoming Governor, Sir George Gipps, he delayed his departure until the arrival of his Excellency on February 23. His Excellency was inclined to take a great interest in the Botanic Garden, and made a great effort to retain Cunningham's services as 'Government Botanist,' a purely scientific appointment, including travel in the colony, leaving the gardening portion of the duties, hitherto attached to the position, to Mr. James Anderson, as superintendent. Cunningham demanded a greatly increased salary on account of the increased cost of living, and his Excellency stated that the proposed salary was not objected to. Still, for some reason or other, the matter was not pressed in the Legislative Council, and on learning this, Cunningham 'finally washed his hands of the garden' in April, 1838.

"In 1837 we have the first record of plants sent from the Botanic Garden, Sydney, to Captain W. Lonsdale, police magistrate, to stock the first Government garden at Melbourne. Almost at the same time plants were sent from Sydney to Captain John Hindmarsh, Governor of the newly-formed province of South Australia.

"During this year Backhouse records that the Norfolk Island pines first produced cones in Sydney. Allan Cunningham, during July, 1837, first formed plantations in Hyde Park. He also did a good deal of tree-planting in the Domain.

"In 1831, as already stated, the enlarged and reorganised garden was first thrown open to the public. In 1838 it was, by the Governor's order, first thrown open to the public on Sundays. Many people now living remember the patriarchal arrangements that took place on that day. The Governor used to attend Divine service at St. James' Church on Sunday mornings, accompanied by his suite and friends. He would then walk over to the existing entrance, near St. Mary's Cathedral, and go across the

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Domain to the entrance of the Gardens near the stone fountain. The Garden gates were closed, but an attendant was waiting to open the gates for his Excellency and party, after which the citizens could enter the Garden. I do not know the date on which the Garden was first thrown open on Sunday mornings.

"Allan Cunningham, on his return from New Zealand, returned to his lodgings in Elizabeth Street, thoroughly broken down in health. On June 24, 1839, he was removed from his lodging to his old official cottage in the Botanic Gardens for change of scene and air. Heward says: 'On Thursday, the 27th, his last breath was sighed away in the arms of his faithful friend, James Anderson' (his successor in the superintendence of the Garden). He died of consumption, a martyr to geographical exploration and botanical science, in the 48th year of his age.

"From this passage it is clear that Cunningham died in the Botanic Gardens. The old cottage, sacred through associations with such a man, was demolished less than 30 years ago. Its site was a little north of the Levy Fountain, and a photograph of it, taken in the Fifties, is still in existence.

"Allan Cunningham was buried in the Church of England portion of the Devonshire Street Cemetery, and a marble tablet to his memory was erected in St. Andrew's Scots Church similar in size to that which he had erected in remembrance of his brother Richard.

"In 1844, as the incription states, an obelisk to Allan's memory was erected on the small island in the course of the creek which flows through the garden to Farm Cove. At this time the tide nearly came up to the obelisk, but filling-in operations now leave the obelisk some distance inland. At the demolition of the Devonshire Street Cemetery the present writer took steps with the view to the removal of Cunningham's remains. These remains (very few) were reverently removed on May 25, 1901, and the actual placing of them in a small leaden casket in a cavity in the obelisk took place in his presence and in that of Mr. George Harwood, the superintendent, and a few friends, on June 26. Thus the obelisk in the Botanic Gardens which has for so many years been a memorial of Allan Cunningham is now also his tombstone. His first tombstone is carefully preserved.

"Allan Cunningham is one of the trio (Robert Brown and Ferdinand Mueller being the others) of botanists and explorers pre-eminent in Australian botanical work, and the permanence of his scientific reputation is beyond the reach of controversy. Allan Cunningham's name will, to the end of time, shed lustre on the Sydney Botanic Gardens. He is the only man whose statue (if he be deemed to require one) can appropriately be placed in that area, sacred with so many botanical associations.

"For some years after Cunningham's death the management of the Garden was not taken sufficiently seriously. The carriage road (part of Mrs. Macquarie's Road) from old Government House to the Chair, passed along the northern boundary of the Garden, thus skirting the present stone wall dividing the middle and lower gardens. This carriage road was fenced with palings, and had the effect of shutting out the view of the harbour, for the

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laying out of the lower garden in the early thirties, and to which I have already alluded, was interfered with by reason of its unfenced and unprotected state. It was not many years before Mrs. Macquarie's Road was diverted out of the Botanic Garden into the Domain, and the fencing of the Lower Garden completed, that is to say, the Lower Garden was shut off from the Domain on the one side, and the Government House or inner Domain and Circular Quay on the other. When that was done, the improvement of the Lower Garden advanced by leaps and bounds.

"On April 22, 1842, died James Anderson, who had been Superintendent of the Garden since Allan Cunningham's resignation. He had been the botanical collector of Captain P. P. King's voyage to South America and the Straits of Magellan, &c., and on Captain King's homeward voyage Anderson remained at Sydney. His administration of the Garden appears to have been uneventful; at all events, I know next to nothing of the progress of the Garden during this period. He was buried in the Devonshire Street Cemetery, and on its demolition in 1901 his remains were removed to the Presbyterian section of the new cemetery at La Perouse.

"Governor's Bourke's statue was unveiled on April 11, 1842. The old cottage, the former residence of one of the Domain bailiffs, was pulled down to enlarge the road, the site fixed for the statue being just inside the paling fence opposite to where the cottage formerly stood.

"William Robertson succeeded Anderson, and died in July, 1844. I know nothing of him or his work. He was succeeded by James Kidd, who had been an overseer since July 22, 1833. Mr. Kidd was informed officially that his appointment was only a temporary one. On the appointment of Mr. Bidwill as director, Mr. Kidd reverted to his position of overseer, a post he continued to hold under Mr. Charles Moore till 1866. I do not know the date of his death. His term of office as acting superintendent appears to have been devoid of important incident.

"The unsatisfactory state of the Garden since Allan Cunningham's death had now impressed itself on the Governor and Council, and on September 1, 1847, Mr. John Carne Bidwill was appointed by the Governor, with the title of director (the first time the title was used for this office), and Government Botanist (also a new designation).

"Sir J. D. Hooker speaks of him as possessed of a remarkable love of botany and knowledge of Australian plants. Our records scarcely refer to him, but I have seen a number of letters from him to the late Admiral P. P. King, Sir William Macarthur, and others, showing that he had done yeoman work in hybridising various bulbous plants. He had spent some years in New Zealand, and the well-known Bunya Bunya (Araucaria Bidwilli) was discovered by him and bears his name.

"Through some confusion, the Home Government also set about making an appointment to the Botanic Gardens, and Mr. Charles Moore was appointed director by the Secretary of State

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for the Colonies, and arrived in Sydney January 14, 1848. Mr. Bidwill had to vacate his appointment on Mr. Moore's arrival, which he did very unwillingly, and with the good wishes of the Governor, who shortly afterwards appointed him Commissioner of Crown Lands for the Wide Bay district of what is now called Queensland. He died March 1, 1853, in his 38th year, after great suffering, caused by exposure in travelling in his district. His Queensland post afforded him many opportunities of making botanical discoveries, and of introducing new plants, of which he very fully availed himself. He was therefore another of the martyrs to science, whom the hardships of early colonial exploration brought to an untimely end, and was at least the fourth officer in charge of the Botanic Gardens who succumbed to zeal for the public service.

"His directorship of the Gardens of little more than three months did not permit him to make his mark on the institution to the extent that he would undoubtedly have done had he continued in office.

"He was, as I have stated, succeeded by the late Mr. Charles Moore, who has but recently passed to his rest. With his directorship commenced the modern era of the Gardens. My predecessor wrote but little, but I have been able to gather together certain data which will enable me, if permitted, at some future time, to lay before my readers some account of the development under his administration of the Sydney Botanic Gardens, an institution of which we are entitled to be proud."

J. H. MAIDEN.

XXXVI.—COLORADO RUBBER.

(*Hymenoxys*, Sp.)

Early in 1904 a correspondent forwarded to Kew an extract from the *Denver Post* of 26th November, 1903, which gave a somewhat enthusiastic account of the discovery by a prospector in Colorado of a rubber-yielding plant. This was spoken of as occurring abundantly in the hills and mesas in the vicinity of Salida, the belt extending into the San Luis Valley, Gunniston County, and as far south as New Mexico. In June, 1905, Mr. E. Naylor, of Bradford, presented to the Museum at Kew a specimen of the dried plant, together with samples of crude and manufactured rubber obtained from it. Mr. Naylor subsequently also communicated seeds of the plant.

Mr. T. D. A. Cockerell, to whom the Museum is also indebted for specimens of the plant and of its rubber, published an account of the species in the *Bulletin of the Colorado Museum* for December, 1903. The plant, which is a member of the natural family *Compositae*, is there identified as *Picradenia floribunda, utilis*, which Mr. Cockerell considers to be part of the aggregate *Actinella Richardsoni*. Subsequently, in the *Bulletin of the Torrey Botanical Club* for 1904, p. 461, the same author has

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indicated that *Picradenia* may be considered a subgenus of *Hymenoxys*, Cass. If this view be correct the Colorado Rubber plant is therefore a species of *Hymenoxys*.

In July, 1906, Mr. Naylor forwarded to Kew a further supply of material. Accompanying this was the following extract from the letter which Mr. Naylor had received with the specimens:—"I have obtained a sample of crude rubber from the experimental plant at Buena Vista; this is, of course, not vulcanised, and if kept in a warm place will become soft and sticky. The round piece is just as it comes from the plant; the flat piece is after its second trip through the machine, and in this form is shipped east to the refinery. The full size of the pieces as shipped is 10 to 15 feet long and 18 inches wide. The root of the native plant yields about 10 per cent. of rubber."

From the evidence thus obtained there is hardly room for doubt that this species of *Hymenoxys* yields a rubber-like product. This does not, however, compare favourably with many of the lower grades of rubber already on the market. It is therefore somewhat doubtful whether the expectations which have been formed regarding it in some quarters will be realised.

J. M. H.

XXXVII.—IRISH GARDENS.

At the invitation of Mr. Moore, of Glasnevin, and at the desire of the Director of Kew, I spent a fortnight in June in visiting some of the more interesting gardens in Ireland. Mr. Moore was fortunately able to accompany me, and, favoured by their proprietors, we inspected the gardens of the following places:—Castlewellan, Kilmacurragh, Mount Usher, Narrow Water, St. Anns, Fota, Belgrove, Darreen, Rossdohan, Ashbourne, near Queenstown, and several other gardens in the neighbourhood of Dublin.

Our special object was to ascertain what had been done in the direction of establishing reputedly tender trees, shrubs, and perennial plants in the more favoured parts of the island. Both Mr. Moore and myself are fairly well acquainted with the gardens of South Cornwall and South Wales, where the climatic conditions are similar to those of the south and west of Ireland. We were therefore in a position to make comparisons and offer suggestions with regard to what might be tried in Ireland. The things we saw, however, far surpassed our most sanguine expectations. Ireland is favoured with a climate and, in many parts, a soil most suitable to gardening; and fortunately a number of people who are in a position to do so are making good use of their gardens and estates by devoting them to what may be termed experimental horticulture.

During the whole fortnight (the latter half of June) it rained daily, usually in the morning, the afternoons being hot and sunny. The vigour and healthy look of plants of all kinds under these conditions were delightful to behold. It might reasonably be said with regard to Irish gardening that the tools most needed are the

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saw, pruning hook, and knife. Generally the plants grow too fast for the gardener, and where plants are set at ordinary distances apart this has its disadvantages. The opinion formed after a fortnight's rapid visit to Ireland in June may not be worth much, but I have no hesitation in saying that of all the countries I have seen Ireland is as well provided by nature with conditions favourable to high-class land cultures—including agriculture, horticulture, and forestry—as the best. In the opinion of competent judges long resident in Ireland, the great need is intelligent labour, but so long as America and other countries hold out tempting inducements in the shape of better conditions of employment to the Irish workers, the best of them will go. If the most were made of the land by employing upon it the best of its people—and there are no better gardeners than Irishmen when they are allowed to use their intelligence—Ireland would soon become the richest instead of, as it is now, the poorest division of the United Kingdom.

GLASNEVIN is to Ireland what Kew is to England. The collection of plants cultivated there is remarkably rich, in some departments the richest I know, whilst their condition is most satisfactory. The zeal of the late and present keepers in collecting, growing, and encouraging others to grow plants of all kinds have no doubt largely contributed to the spread of a taste for gardening in Ireland. This influence is now being turned to account by the Irish Board of Agriculture in the promotion of fruit and vegetable culture, Mr. Moore having the control of a training college where gardeners are taught the best methods of cultivation for the best kinds of fruit and vegetables and then sent to different stations in the country where model gardens are formed under Mr. Moore's superintendence. The men are trained gardeners before they enter the college, and in return for good work they are well paid all the time they are there. In this practical way a knowledge of high-class horticulture is being distributed over the country, and if this is only backed up by capital on the one hand and an intelligent treatment of the workers on the other, the effort cannot fail to have far-reaching results. During the time of my visit to the college a party of Scotch farmers were being shown round by Mr. Houston, the horticultural science instructor, who is also editor of an excellent little monthly journal devoted to Irish gardening. Agriculture is also assisted in the Glasnevin Botanic Garden by the cultivation of plots of agricultural plants of all kinds, including grasses, plants yielding dyes, oils, fibres, tobacco, &c. Each plot bears a label showing name and time of sowing. There is also a garden of herbs and other economic plants.

Before leaving Glasnevin, note must be made of the "lions" of the collection, such as *Nepenthes Rajah*, a grand plant over 20 years old; Gleichenias, the largest specimens I have ever seen; *Eulophiella peetersiana*, a giant with leaves 4 feet long and 6 inches across; the fine specimens of palms and cycads; the extensive and well-grown collection of orchids; the superb water-gardening, where Nymphaeas are magnificent; alpine plants and hardy ferns, all in splendid health. Certainly the national botanic garden of Ireland is one of its most valuable assets.

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CASTLEWELLAN. The Earl of Annesley has made his garden famous throughout Europe. It is the best proof that Ireland is a great gardeners' country that in the lifetime of one man a hillside should have been turned into a grand "gallery" of trees and shrubs in which giant specimens of many kinds of *Coniferae*, looking at least a century old, of many kinds of New Zealand, Chilian, Californian, Himalayan, and South European trees and shrubs in the rudest health, all testify to the genial character of the climate, the richness of the soil, and the sagacity of the proprietor. A full account of this garden, with photo-illustrations of some of the specimen plants, was recently published by the Earl of Annesley. As an indication of what may be found there I may mention the following:—*Picea morindoides*, a grand specimen tree, unique in Europe; *Fagus cliffortiana*; *Cornus florida*, a big bush in flower; *Fejoia sellowiana*, happy as a privet; *Restio subverticellatus*, three years outside and looking quite happy; *Acer Hookeri*; *Cordyline indivisa*, true, a grand plant with leaves 6 inches across; *Lomatia ferruginea*, a beautiful Protead well set with flower buds and since figured for the *Botanical Magazine*. There was the usual display of Olearias, Tricuspidarias, *Azalea indica*, Himalayan Rhododendrons, &c.

KILMACURRAGH. The garden of Mr. Thomas Acton is the most interesting in Ireland. Here there is little evidence of keep, but there has been much judgment in the planting, and generally things look happy. The soil appears to be deep and rich, and there is plenty of water. The great feature at the time of our visit was a tree of *Embothrium coccineum* in full bloom—it was 35 feet high with a spread of 30 feet, the trunk 15 inches through, and covered with flowers: this was planted as a baby about 30 years ago by Mr. Acton. *Desfontainea spinosa*, 12 feet through; *Drimys Winteri*, 30 feet high, in full bloom; *Magnolia Campbelli*, 25 feet high; *Tricuspidaria lanceolata* (*Crinodendron hookerianum*), 18 feet high, 10 feet through, the branches weighed down by the flowers—I never saw such a plant; *Swammerdamia Antennaria*, 10 feet high, 15 feet through, covered with flowers; and the Himalayan Rhododendrons—many finer than the finest in Cornwall—*R. Keysii* (9 feet), *R. Delavayi* (8 feet), *R. decorum* (10 feet), *R. lacteum* (6 feet), *R. Roylei* (12 feet), *R. argenteum* (18 feet), and many others—not thin bushes, but fat, mostly wider than high, and in grand health. It was worth the journey to Ireland to see *R. Falconeri* there—such a bush—18 feet high and 21 feet through, with six main branches each over 6 inches in diameter; it bore the remains of hundreds of flower-heads, and was in the midst of making new growth. I noted also the following (the figures in each case indicate height and spread of branches):—*Podocarpus chilina*, 22 feet; *Saxegothea conspicua*, 15 feet by 12 feet; *Athrotaxis selaginoides*, 34 feet; *A. laxifolia*, 20 feet; *A. imbricata*, 15 feet; *Cupressus lusitanica*, with a trunk 3 feet in diameter and a wide-spreading oak-like head; *Prumnopitys elegans*, 25 feet; *Podocarpus nubigenus*, 20 feet; *Libocedrus tetragona*, 12 feet; *Pinus aristata*, 12 feet; *Fagus Moorei*, 14 feet; *F. Cunninghamii*, with a trunk 15 inches through, 40 feet high; *Olea intermedia*, a large tree; *Cunninghamia sinensis*, 25 feet; *Laurelia aromatica*, planted 30 years ago, now 40 feet high and growing with great vigour; *Ilex latifolia*,

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12 feet; *Myrtus Luma*, 15 feet by 15 feet; *Fuchsia excorticata*, 15 feet; *Senecio Greyi*, 4 feet by 10 feet, a magnificent mass of yellow flowers. *Ceratonia Siliqua*, a big bush, has stood out for 30 years. The commoner trees are well represented. I noted *Cupressus lawsoniana*, 80 feet high; *Abies Pindrow*, 50 feet; and there is a grand avenue of silver firs leading up to the house. Mr. Acton, now an octogenarian, has been his own gardener all his life.

The only nursery we visited was that of Mr. T. Smith in the town of Newry. This is one of the most interesting gardens in Ireland. The collection is quite botanical in comprehensiveness; I doubt if there is another commercial collection of hardy plants like it anywhere. Not only for Ireland, but for England, the continent, and even America this nursery is the "shop" for the choice and rare among hardy plants. The proprietor, an Englishman, trained in the Chelsea nursery of Messrs J. Veitch and Sons, is a keen collector and cultivator, and his knowledge of plants is quite exceptional. I found many plants there that were not in the Kew collection. The prominent features at the time of our visit were the Verbascums, large beds of them in full flower; *Anchusa italica grandiflora*, *Saxifraga pyramidalis*, *Incarvillea Delavayi* by the thousand, the racemes 2 feet high and the flowers enormous; Primulas, Dianthuses, Delphiniums, Helianthemums, and Roses. We spent the greater part of a day in the nursery before proceeding with Mr. Smith to Narrow Water, where there is a fine garden and collection of plants formed by the proprietor, Captain Hall.

MOUNT USHER is the delightful garden retreat of the brothers Walpole of Dublin. Formerly a mill-house on a stream in a sheltered nook it has been transformed into a garden paradise. I have never seen a more lovely garden. Water plants, ferns, herbaceous and alpine plants and flowering trees and shrubs are grown in the greatest luxury and profusion. One part of the garden is almost a wood of *Cordyline australis*, the under growth being formed of such plants as *Mitraria*, *Tricuspidaria*, *Romneya*, *Desfontainea*, *Solanum crispum*, *Salvias*, *Calceolaria violacea*, *Habrothamnus*, *Lavatera assurgentiflora*, etc. *Eremurus robusta* was 9 feet high, *Abutilon vitifolium* 20 feet, and a colony of *Meconopsis Wallichii* as happy as sow thistles. The water plants were most effective—great masses of *Saxifraga peltata*, *Primula sikkimensis*, Rodgersias, Gunneras, Nymphaeas, *Mimulus*, *Ourisia coccinea*, *Orchis foliosa*, Japanese Iris, *Myosotidium nobile*, *Parechites communis*, Gentians, *Senecio macrophylla* and many others were very happily provided for. The stream sides were richly clothed with ferns and other suitable plants.

DARREEN. This is the Irish home of the Marquis of Lansdowne, who adds to his great political reputation that of being a keen amateur gardener and an excellent landlord. His garden of some 30 acres is on the south side of Galway Bay, and here, as in other gardens that we saw, the conditions favour the cultivation in the open air of what are known as sub-tropical plants. The most striking features of the garden are magnificent

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masses of Indian Bamboos and gigantic coniferous trees. I have never seen *Abies nordmanniana* so perfect and luxuriant as at Darreen. *Gaultheria Shallon* was 8 feet high, *Griselinia littoralis* planted in 1882 was 30 feet high, *Veronica Traversii* 15 feet, *Acacia dealbata* 50 feet, *Eucalyptus Globulus* 80 feet, *Azara microphylla* 25 feet, *Olearia Forsteri* 20 feet by 20 feet, *Euphorbia mellifera* 10 feet through, *Erica arborea* 10 feet, *Myrtus Luma* 20 feet, *Ilex crenata* 15 feet by 15 feet, *Leptospermum lanigerum* 15 feet; enormous plants of *Cordyline*, one measured had a stem 3 feet in circumference; Kalmias like Portugal laurels; Leptospermums like Privets; Metake bamboo 12 feet high, and Falconer's bamboo 25 feet high, 40 feet spread, with 1,000 canes, all in flower, a marvellous sight.

ROSSDOHAN. This is also on Galway Bay and is the property of Dr. Heard. It is practically an island and some twenty years ago was almost waste land with scarcely a tree upon it. By planting first shelter trees and then many kinds of Australian, New Zealand, Himalayan, and Californian trees and shrubs it has been turned into a jungle of exotic vegetation. Simon's bamboo 15 yards across, *Aralia Maximowiczii* 20 feet high, *Acacia decurrens* 30 feet, *A. melanoxylon* 20 feet, *A. falcata* 30 feet, *Eucalyptus urnigera* 40 feet, *Olea europaea* 15 feet, *Melaleuca hypericifolia* 10 feet, *Cassinia longifolia* 15 feet, *Hakea saligna* with a 12 inch stem, *Agonis marginata*, great shrubs; *Brugmansia sanguinea*, Pittosporums, Escallonias, Kunzeas, Ozothamnus, Callistemons, Boronias, Camellias, *Daphne indica* and *Asparagus plumosus*. These are a few of the plants noted as being successes in Dr. Heard's garden. It is clear that, with shelter from the strong sea winds, a very large number of plants from sub-tropical regions may be grown on the south-west side of Ireland. We were unable to get to the garden of Lord Dunraven, also in Galway Bay, but we were informed that it is of similar character to those of Lord Lansdowne and Dr. Heard.

FOTA. This, the seat of Lord Barrymore, is famous for its garden, the noblest in Ireland and one of the most delightful in the world. I saw it fifteen years ago and was astonished by the change that had taken place in so short a time. Truly, plants grow rampantly in Ireland. Fota is a place of trees, especially conifers. An evergreen oak with a trunk nearly 7 feet through, a cork-barked tulip-tree and groves of *Cordyline* and *Yucca gloriosa* near the entrance give the note for the whole place. All Falconer's bamboos have flowered and there are hundreds here, the children of those which flowered at Fota thirty years ago. A list of the big trees in this garden would be longer than space will permit. The special things that may be mentioned are *Fagus Cunninghamii*, 50 feet; *Embothrium coccineum*, 30 feet by 30 feet; *Benthamia fragifera*, 40 feet by 50 feet; *Berberis nepalensis*, 12 feet by 20 feet; *Pittosporum Mayi*, 40 feet; *Ilex latifolia*, 40 feet; *Genista raxemosa*, 12 feet; *Eriobotrya japonica*, a grand old tree; *Acacia dealbata*, a tree; *Clianthus puniceus*, 30 feet through; *Dusylirion longifolium; Asparagus retrofractus*, a great mass against a wall; *Phoenix senegalensis*, two big specimens outside for twelve years. The great trees of *Pinus Ayacahuite*, *P. insignis*, *P. Montezumae*, *Picea Morinda*, *P. alcockiana*, *Abies grandis*, *A. numidica*, *A. bracteata*, *A. religiosa*, *A. webbiana*,

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A. cephalonica, *Tsuga brunoniana*, and Cryptomerias are grand to see, and the groves of bamboos, Phormiums, Cordylines, Chamaerops, Aralias, etc., are noble. Water gardening is a special feature, and in swampy situations there are many kinds of flowering and foliage plants that love moisture.

BELGROVE. A few miles from Fota is Mr. Gumbleton's garden, the home of many rare and interesting plants, the proprietor being a very keen collector and tester of plants of all kinds. Mr. Gumbleton knows more about garden plants than any amateur that I have ever met, and his knowledge has full play in his own garden. We were unfortunate in having to see the garden on a pouring wet day. Some of the plants noted were *Anemone Fanninii*, a mass 6 feet through, the peltate leaves 2 feet high and 15 inches across, and the scape 6 feet: I had never seen this plant so good, although Kew introduced it about 15 years ago. *Olearia insignis* against a wall bore 9 flowers. *Freylinia cestroides*, 10 feet; *Daphniphyllum glaucescens*, 18 feet by 18 feet; *Pterostyrax hispida*, a tree draped with its lovely white flowers; *Plagianthus Lyallii*, *Xanthoceras sorbifolia*, *Buddleia Colvillei*, *Eucryphia pinnatifolia*, *E. cordata*, *Romneya Coulteri*, *Escallonia langleyensis*, *Veronica Hectori*, and *V. Lindsayi* were seen in fine condition. Mr. Gumbleton also makes a speciality of Begonias, Pelargoniums, Disas, and of course, herbaceous plants.

ST. ANNS. The stately home of Lord Ardilaun is more like an English nobleman's residence than any that I saw in Ireland; and this is true of the garden also. The keep of the place is good, the collections of plants are comprehensive and well cared for, and there is an air of cultivation wherever one looks. Lady Ardilaun is a keen gardener and loves to experiment with plants of doubtful hardiness, providing shelter fences and hurdles for those supposed to need it until they are well established. *Buddleia Colvillei*, a bush 12 feet high, was in flower; also big bushes of *Cassia corymbosa*, *Carpenteria californica*, and *Pentstemon coccineum*. Roses and carnations are splendidly grown there.

ASHBOURNE. Mr. Beamish has formed here a delightful garden which in a few years will most likely be much talked about. It is partly on a steep slope with the bare rocks showing here and there, a situation that lends itself to rock gardening, and Mr. Beamish has made the most of it. The whole garden is well conceived and the construction of the rockery most picturesque. Plants grow exceptionally well there, and as the proprietor spares neither money nor pains to secure the best, his garden is sure to prosper.

W. W.

XXXVIII.—MISCELLANEOUS NOTES.

Mr. HARRY DODD, a member of the gardening staff of the Royal Botanic Gardens, has been appointed by the Secretary of State for the Colonies, on the recommendation of Kew, Curator of the Botanic Station at Onitsha, Southern Nigeria.

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Mr. WILLIAM HEAD, a member of the gardening staff of the Royal Botanic Gardens, has been appointed by the Secretary of State for India in Council, on the recommendation of Kew, a probationer gardener for service in India.

Mr. RUPERT BADGERY, a member of the gardening staff of the Royal Botanic Gardens, has been appointed by the Secretary of State for India in Council, on the recommendation of Kew, a probationer gardener for service in India.

J. M. CROMBIE.—The Rev. James Morrison Crombie, F.L.S., was born at Aberdeen in 1831,* and was educated at Marischal College there, and at Edinburgh University, where he took his M.A., and was subsequently appointed a minister in the Established Church of Scotland. He was early attracted to natural history, and his first production was a small volume on Braemar in 1861. Five years later he came to London and held various appointments till failing health in 1903 compelled him to give up his latest post as Clerk to the Synod in England. He died at Ewhurst, Surrey, on 12th May, 1906.

He was lecturer on Botany at St. Mary's Hospital from 1879 to 1886, but the work by which he is best known, was his work on Lichens; he determined the collections brought home by numerous travellers, and described them as parts of these series or as detached papers in journals; he also drew up accounts of the Lichens in the herbaria of Dillenius and of Withering. He issued a brief account of British Lichens in 1870, and designed a fuller monograph with descriptions of the species in the British Museum, of which he only completed the first volume. He was thoroughly in accordance with his old friend Nylander in rejecting the symbiotic theory of Lichens, and this strong prepossession coloured much of his writings. The Herbarium at Kew was indebted to him for the determination from time to time of Lichens belonging to the collection.

B. D. J.

* The late Mr. Crombie has been stated by his widow to have been born on 20th April, 1830, by himself to have been born in 1833. The latter date is certainly incorrect, the former is probably so. Professor Trail, who has kindly made the necessary enquiries, finds that there is no entry in the Parish Register of Mr. Crombie's birth; the entry refers to his baptism, and is as follows:—"Baptisms in Old Machar in 1831, April 20, 1831, John Crombie, ship captain, "Huntly Street, and his spouse, Ann Morrison, had a son born named James "Morrison, baptised by the Rev. Joseph Thorburn; witnesses, James and "William Morrison." Mr. Crombie attended the Arts Classes, Marischal College, Aberdeen, during the sessions 1847–48 and 1848–49.

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WILLIAM JAMES FARRER.—Sincere regret will be expressed not only by those to whom he was personally known, but also by all interested in the important problems connected with the improvement of wheat, on learning of the sudden death, resulting from heart disease, of Mr. William James Farrer, of Lambrigg, N.S.W.

Farrer was born near Kendal in Westmorland in 1845, and was educated at Christ's Hospital (Bluecoat School). He afterwards entered Pembroke College, Cambridge, where he graduated in 1868, being placed among the Wranglers in the Mathematical Tripos.

On account of ill-health he sailed for Australia about 1870, and was employed as a surveyor under the Lands Department of New South Wales.

In 1886 he resigned his connection with the Survey Office and devoted himself to the systematic improvement of wheat by cross-breeding and selection, always keeping in view two primary objects—resistance to drought and to rust, maintaining at the same time a high milling standard. The success achieved in this direction is now common knowledge, and it is highly probable that in the near future wheat will be profitably grown over immense tracts in Australia, which up to the present have been considered unsuited to it on account of drought or the prevalence of rust. His work has also been appreciated outside Australia. A few years ago Mr. Morland, Director of Agriculture in the United Provinces of Agra and Oudh, India, paid a visit to Australia to study the methods adopted by Farrer, with the object of instituting similar lines of research in India. Farrer's work was also much appreciated in the United States.

In 1898 Farrer was engaged as Wheat Experimentalist by the Minister of Mines and Agriculture, a post which he filled to the time of his death.

G. M.

Visits to Ireland and Scotland.—The Curator of the Garden, Mr. Watson, paid a visit to Ireland, which extended from June 18 to July 1, 1906, for the purpose of seeing some of the more notable gardens in that country. Mr. Watson's report on this visit, which proved to be very interesting and profitable, is published in the current number of the *Bulletin*.

The Assistant Curator of the Garden, Mr. Bean, visited Scotland with a similar object between July 9 and July 27, 1906. This visit was attended with equally satisfactory results. Mr. Bean's report will appear in a subsequent *Bulletin*.

Elliottia racemosa, *Muhl.*—A peculiar, and to botanists a regretful, interest attaches to those plants that have become or are becoming extinct in a wild state. *Elliottia racemosa* is one of these. It was first discovered early in the last century by Stephen Elliott—in honour of whom the genus is named—on the banks of the Savannah River in Georgia. It was afterwards found again twice on the banks of the same river. But the only site on which

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for many years it is known to have occurred is now under cultivation, and *Elliottia racemosa* probably exists in a few places as a cultivated plant only. Through the kindness of Mr. P. G. Berckmans, a nurseryman of Augusta, Georgia, who at one time possessed (as he expressed it) "the sole visible representatives "of the species," Kew has in cultivation now two small, but healthy, specimens. Mr. Berckmans first sent plants to Kew in 1894, and in a letter dated February 27, 1894, says: "I take "pleasure in sending you a few plants of *Elliottia racemosa*, "which are the first I have ever been able to propagate since I "collected a few plants 30 years ago in company with the late "Dr. Asa Gray. Our attention was called to some shrubs which "were growing in a high sandy pine section about 15 miles from "Augusta and producing very showy flowers. Very much to our "delight we found these to be the exceedingly rare *Elliottia*." These plants, sent in 1894, however, did not take root, and ultimately died. In 1902 two more plants were sent, and these, fortunately, are now well established in the open ground. The species is evidently one not easy to propagate. Several methods were tried by Mr. Berckmans, but even a moderate success was only attained by means of root-cuttings. It is likely, therefore, to long remain a plant of exceeding rarity. Kew possesses probably the only plants in Europe.

Elliottia is a genus belonging to the *Ericaceae*, of which *E. racemosa* is now considered to be the sole representative. Two Japanese shrubs, viz., *Tripetaleia bracteata*, Maxim., and *T. paniculata*, Sieb. & Zucc., were, by Bentham and Hooker, placed under *Elliottia*, but the genus *Tripetaleia* has latterly been restored by Drude. Neither of these Japanese species possesses the attractive qualities of the true *Elliottia* of Georgia, which grows to as much as 10 feet in height, and has alternate deciduous leaves 1½ to 5 inches long, dark green above, paler and slightly hirsute beneath. Its flowers are borne in terminal racemes 6 to 10 inches long, each flower being about 1 inch in diameter, the corolla consisting of four white narrow-oblong petals. The fruit is unknown. The only published figure of the species is in "Garden and Forest," 1894, p. 205.

Presentations to Museums.—DRIFT FRUITS.—An interesting series of Drift Fruits and Seeds collected by Dr. H. B. Guppy during 1904 in the Guayaquil River and on the coast of Ecuador and the Pacific and Atlantic sides of the Panama Isthmus has been mounted and placed in the special case reserved for drift material opposite Case 85, Museum No. I.

ST. LOUIS EXHIBITION.—A Bronze Medal and a Diploma awarded to the Board of Agriculture and Fisheries for its exhibit at the St. Louis Exhibition, 1904, have recently been received at the Museum.

Part of the exhibit consisted of a plan and a series of photographic views of the Royal Botanic Gardens, Kew, a duplicate set

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of which will be found in Museum No. III., together with the Diploma. The Medal has been placed in the case reserved for similar objects on the top floor of Museum No. I.

It may mentioned here that copies of these views exhibited by H.M. Office of Works gained a similar distinction at the Paris Exhibition of 1900. The Medal and Diploma then obtained will be found side by side with those awarded at St. Louis.

The official description of the St. Louis Medal is as follows :—

> In the composition of the obverse of the medal are shown two figures, one of which, Columbia, tall and stately, is about to envelop the youthful maiden by her side, typifying the Louisiana Territory, in the flag of the stars and stripes, thus receiving her into the sisterhood of States. The other figure is depicted in the act of divesting herself of the cloak of France, symbolized in the emblem of Napoleon, the busy bee, embroidered thereon. In the background is shown the rising sun, the dawn of a new era of progress to the nation.
>
> The reverse of the medal shows an architectural tablet bearing an inscription giving the grade of the medal. Below the tablet are two dolphins symbolizing our eastern and western boundaries, the whole surmounted by an American Eagle, spreading his wings from Ocean to Ocean.
>
> On the Gold Medal there are three distinct corners, each containing a wreath encircling a monogram or emblem, and each of these wreaths is surrounded by 14 stars, representing the Louisiana Purchase States and Territories. On the Grand Prize design there is the same number of stars in the upper field of the shield, and there are 13 bars in the lower field, representing the original States. On the design of the Silver Medal the artist has used the cross of the Order of Saint Louis.
>
> The medal was designed by Adolph A. Weinman. The design was approved by a committee composed of J. Q. A. Ward, Daniel C. French, and Augustus St. Gaudens.
>
> The dies were engraved and the medals struck by the United States Government Mint at Philadelphia. The alloy for the medals was made especially for the Exposition after samples were submitted and passed upon by expert medallists.

FORESTRY EXHIBITS.—His Grace the Duke of Wellington, K.G., G.C.V.O., Strathfieldsaye House, Mortimer, has presented to the Museum a fine series of Photographs illustrative of Forestry in this country.

The Most Hon. the Marquis of Lansdowne, K.G., G.C.S.I., Bowood, Calne, Wilts, has presented to the Museum planks of the following home-grown timbers :—

Liriodendron tulipifera,
Quercus Cerris,
Sequoia gigantea.

G. F. Luttrell, Esq., Dunster Castle, Dunster, Somerset, has presented to the Museum a longitudinal section of "Brown Oak."

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JAMAICA TEA.—Several samples of Tea grown and prepared at Claremont, Jamaica, have been presented to the Museum by Mr. H. E. Cox at the request of Sir Daniel Morris, K.C.M.G., Commissioner of the Imperial Department of Agriculture, West Indies. The samples will be found in case 10, Museum No. I., together with Tea grown and prepared at the Cinchona Plantations, Jamaica, from Assam plants received in the Island in 1868. This latter specimen was forwarded to Kew by Mr. R. Thompson in 1874. Another sample from this island was obtained from the Jamaica Court, Colonial and Indian Exhibition, 1886.

OIL SEEDS.—Seeds of *Telfairia occidentalis*, Hook. f., which is described as a lofty climber of the order *Cucurbitaceae*, have recently been received from a Liverpool firm as an oil-seed from the Gold Coast, for determination. Samples of these seeds have frequently been submitted for identification; so far as was previously known, they are only used as a food, for which purpose the plant is commonly cultivated by negroes in Tropical Africa, the seeds being boiled before eaten.

Specimens of the fruit, which is about two feet long and is acutely ribbed, together with examples of the large orbicular seeds from Lagos and the Gold Coast, and germinating seeds from the Royal Gardens, are exhibited in case 57, Museum No. I.

Additions to the Herbarium during 1904.—Donations of specimens were made by about ninety persons and institutions, and amounted to over 8,000 sheets. The specimens purchased amounted to over 4,000 sheets. The principal collections are enumerated below.

VARIOUS PARTS OF THE WORLD. *Presented:*—Mosses, by Dr. V. F. Brotherus; type-specimens of his species of Inocybe, by Prof. C. H. Peck.

Purchased:—Heller, Fungi of Puerto Rico and Hawaii; Kneucker, "Gramineae Exsiccatae," lief. xv.-xvi.

EUROPE. *Presented:*—"Hieraciotheca gallica et hispanica," fasc. xiii.-xiv., by M. G. Gautier.

Purchased:—Dahlstedt, Scandinavian Hieracia, Cent. xvi.; W. H. Pearson, British Hepaticae; Woloszczak, "Flora polonica exsiccata," Cent. x. and xi., *part.*

ORIENT. *Presented:*—Cyprus, by Miss E. A. Samson.

EASTERN and CENTRAL ASIA. *Presented:*—Orchidaceae and Ranunculaceae, by the Natural History Museum, Paris; Japan, by Mr. H. J. Elwes; China, principally Hong Kong, by Mr. W. J. Tutcher.

Purchased:—Takeda, Japan, Cent. i.-ii.

INDIA. *Presented:*—By the Botanic Gardens, Calcutta; by Sir D. Brandis, K.C.I.E.; by Lieut.-Col. A. A. Barrett; Himalayan Mosses, by Mr. J. F. Duthie.

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MALAYA. *Presented*:—Philippine Islands, by the Bureau of Government Laboratories, Manila; Northern Siam, by Mr. C. B. Clarke; Siamese trees, by Mr. D. O. Witt.

AUSTRALASIA. *Presented*:—Beckett, New Zealand Mosses, by Mr. J. F. Duthie; Chatham Islands, by Mr. F. A. W. Cox; Norfolk Island and New South Wales, by Mr. J. H. Maiden.

TROPICAL AFRICA. *Presented*:—Whyte and Sim, Liberia, by Sir H. H. Johnston, G.C.M.G., K.C.B.; Pobèguin, Grasses of French Guinea, by the Natural History Museum, Paris; W. R. Elliott, Nigeria, by the Imperial Institute; Klaine, Gaboon, by the late M. L. Pierre; Hereroland, by Prof. H. H. W. Pearson; Sudan, by Mr. A. F. Broun; Somaliland, by Major D. Thomson; Uganda, by Mr. M. T. Dawe; Allen, Victoria Falls, by Sir C. Metcalfe, Bart.; do., by Mr. C. E. F. Allen; Thymelaeaceae, by Botanic Garden, Berlin.

SOUTH AFRICA. *Presented*:—By Dr. H. Bolus; by Prof. P. MacOwan; Schlechter, South and South-West Africa, by Dr. H. Schinz; Transvaal, by Mr. J. Burtt Davy; Bonomi, Tristan d'Acunha, by Prof. P. MacOwan; Cape Ericaceae, by Mr. E. E. Galpin; Asclepiadaceae, by Dr. S. Schönland.

Purchased:—Junod, Transvaal.

NORTH AMERICA. *Presented*:—Greenland, by Mr. C. H. Ostenfeld; Langworthy, Vancouver Island Mosses, by Mr. W. Bellerby; Central New York, by Dr. J. V. Haberer; Williams, Fungi of the United States, by the U.S. National Museum; Orchids, by Mr. Oakes Ames; Crataegus, by the Arnold Arboretum.

Purchased:—Heller, California; Hall, California; C. F. Baker, West Coast, North America; Metcalfe, New Mexico; Eggleston, North-Eastern United States.

CENTRAL AMERICA. *Presented*:—Gaumer, Yucatan, fasc. ii., by the Field Columbian Museum, Chicago.

Purchased:—C. F. Baker, Nicaragua.

WEST INDIES. *Presented*:—By the New York Botanic Garden.

Purchased:—Curtiss, Isle of Pines; Nichols, Jamaica.

TROPICAL SOUTH AMERICA. *Presented*:—Seed-drift from the rivers and coasts of Ecuador and Panama, by Mr. H. B. Guppy; Weir, Mosses, by Mrs. S. Weir.

Purchased:—Ule, Amazons; Fiebrig, Paraguay; Reineck, South Brazil.

TEMPERATE SOUTH AMERICA. *Presented*:—Cryptogams from Gough and South Orkney Islands, by Mr. R. N. R. Brown; Argentine Republic, by Mr. T. Stuckert.

The largest collection received was from the Philippine Islands, and consisted of about 1,600 specimens presented by the Bureau

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of Government Laboratories, Manila, to which Institution nine volumes of Hooker's Icones Plantarum, Ser. III., were sent in exchange.

An interesting series of collections by Messrs. A. Whyte and D. Sim in the Republic of Liberia was communicated by Sir H. H. Johnston, G.C.M.G., K.C.B., on behalf of the Monrovian Rubber Company. The collections were made in the following localities :—(1) Within a radius of six miles round Monrovia; (2) in the hinterland of Monrovia, within a radius of 20 miles from Kaka Town; (3) in the basin of the Sinoe River. They comprised over 260 species, of which 67 were found to be new. Sim's collections consisted chiefly of Apocynaceae, and the novelties have been described in the Addenda to Dyer, Fl. Trop. Afr., vol. iv., sect. 1. Among the plants collected by Whyte were 4 new genera and 58 new species, which have been described in a paper by Dr. O. Stapf, entitled "Contributions to the Flora of Liberia" (Journ. Linn. Soc. Bot., vol. xxxvii., pp. 79–115).

The first instalment, numbering 500 sheets, of an interesting collection from the Amazons region was acquired by purchase from Dr. E. Ule. Besides exploring the Jurua and other Brazilian tributaries of the Amazons, Dr. Ule traversed much of the ground formerly botanized over by Spruce, and his collections, besides supplementing those formed by the latter, actually contain new species from such places as Tarapoto, where Spruce collected a very extensive series of specimens.

Other valuable accessions were :—A series of over 500 Indian plants, including 160 Acanthaceae from the Malay Peninsula, presented by the Botanic Gardens, Calcutta; about 500 Uganda plants, collected by Messrs. M. T. Dawe and E. Brown, and presented by the former; about 450 West Indian plants presented by the New York Botanical Garden; 300 plants from the Isle of Pines, near Cuba, purchased from the collector, Mr. A. H. Curtiss; and 200 sheets of Klaine's Gaboon specimens, presented by the late M. L. Pierre, who published descriptions and discussed the affinities of many of the novelties in the Bulletin Mensuel de la Societe Linnéenne de Paris.

Cotoneaster microphylla, *Wall.*, naturalised in England.—Mr. S. T. Dunn (*Alien Flora of Britain*, p. 71) records *Cotoneaster microphylla*, Wall., as "said to be naturalised on Brean Down, in Somerset." The specimen on which this statement is based is at Kew, and was received in 1892 from Mr. Arthur Smith, with the information that it "is established on Brean Down, Somerset." Within the last few weeks two other specimens, collected under conditions suggesting actual naturalisation, have reached Kew. One came from the chalk downs, near Ventnor, in the Isle of Wight, and was communicated by Mr. F. R. Armitage. The other was found by Mr. A. D. Annesley, of Amberley, Stroud, Gloucestershire, on Radborough Common, near Stroud, several hundred yards away from any house. *C. microphylla* is a native of the Himalayas from Kashmir to Bhotan, and ranging from

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4,000–8,000 feet, and in a varietal form (var. *glacialis*) even up to 14,000 feet. It was first grown in England about 1825 from seeds sent by Dr. Wallich, and has ever since been in cultivation in this country, usually for covering walls. It is not often the case that woody plants become naturalised, and authentic cases are therefore worth being put on record.

Rhododendron aucubifolium.—When working out the genus *Rhododendron* for the enumeration of Chinese plants in the Journal of the Linnean Society, I described a *R. aucubifolium* (vol. xxvi., p. 19), and on the authority of Dr. A. Henry, stated that it was very rare, only one bush having been observed. The specimens were mounted, and the flowers detached from the branches when they came into my hands; but there was no apparent reason for doubting the relationship of the leaves and flowers. However, Mr. E. H. Wilson, who visited the locality in which it was supposed to grow, failed to find a *Rhododendron* agreeing in foliage with my *R. aucubifolium*. Recently comparing his very long series of specimens of *Rhododendron*, Wilson was struck by the strong likeness of the flowers of *R. aucubifolium* to those of *R. pittosporifolium*, Hemsl., and on placing them side by side they proved to be the same. Then a close examination of the leafy branches brought to light the fact that inflorescences of *R. pittosporifolium* had been inserted in the tips of the somewhat thick branches of *Daphniphyllum macropodum*. The basal part of the inflorescence of the *Rhododendron* is still present in each specimen in the branch of *Daphniphyllum*, and so deftly were the inflorescences inserted that it is necessary to look very close to see the deception.

This is not the only instance of this kind of perverted ingenuity practised by one of Dr. A. Henry's Chinese coolies, named Li Ten Yao. These artificial combinations were not detected by Dr. A. Henry, because he had not time to examine a tithe of the plants brought in by his collectors. However, Li was a good collector, though a little unscrupulous as to the nature of some of his novelties, and Mr. Wilson engaged him as an assistant, knowing of his wicked ways. One day Li, who by the way was a convert to Christianity, came with "a very rare and curious plant," which he had had the good luck to discover. He was permitted to go into particulars, and then his fraud was exposed before his comrades, and he had to suffer the loss of a fortnight's pay. In this instance he had associated *Rhus semialata* and a species of *Viburnum*, and, so far as we know, this was his last creation.

W. B. H.

Presentations to the Library during 1903.—The following works, many of which are of considerable value, were presented by the Bentham Trustees: *Angelita, I pomi d'oro*, 1607; *Conder, Landscape Gardening in Japan*, and *Supplement*, 1893; *Gallesio*,

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Pomona italiana, 1817–39, a magnificent work in 6 folio volumes, and *Gli agrumi dei giardini botanico-agrarii di Firenze*, 1839, by the same author; *Jordan & Fourreau, Icones ad floram Europae*, 1903, the completion of vol. ii. (74 plates), and the whole of vol. iii.; *Lonitzer, Botanicon: plantarum historiae, cum earundem ad vivum arteficiose expressis iconibus, tomi duo*, 1565; *Markham, The English Husbandman*, 1635; *Mascall, A booke of the arte and maner howe to plant and graffe all sortes of Trees*, etc., 1572; *Ortus Sanitatis*, in German, printed by Schönsperger at Augsburg in 1496; *Venuti, De agricultura opusculum*, 1541; *The English Flower Garden; a monthly magazine . . . by W. Thompson*, 1852–53, 2 vols., and all published of a third; *L'Horticulteur universel . . . rédigé par C. Lemaire*, etc., 1839–46, 7 vols. The continuation of about 20 serial publications have also been presented by the Bentham Trustees. Further publications of the Musée du Congo, including *Études de systématique et de géographie botaniques sur la flore du Bas- et du Moyen-Congo, par E. De Wildeman*, i., fasc. 1, have been received from the Secrétaire Général du Département de l'Intérieur, Brussels, and several works by Dr. De Wildeman, chiefly on the flora of the Congo, from the author. *Donn, Hortus cantabrigiensis*, ed. 8, 1815; *Haworth, Synopsis plantarum succulentarum*, 1812, 2 copies; and 37 photographs, chiefly of species of *Agave* in the collection of Baron de Jonge van Ellemeet, were presented by Mr. T. H. Kellock. *Fraser, Notes on the Natural History*, etc., *of Western Australia*, 1903, received from Dr. A. Morrison; *Geare, A list of the publications of the United States National Museum* (1875–1900), etc., 1902, from the Secretary, Smithsonian Institution; *Kickx, Relation d'une promenade botanique et agricole dans la Campine* (1835), from Prof. A. Cogniaux; 7 paintings of Orchids, from Mr. J. F. Last; 49 plates from the *Acta horti petropolitani*, from Mr. S. Sommier; *Preliminary list of vernacular names of Trees, Shrubs*, etc., *found in the forests of the Madras Presidency*, 1901, from Mr. A. W. B. Higgens; *Maiden, The Forest Flora of New South Wales*, parts 1–5, 1902–03, from the Hon. the Secretary for Lands, N.S. Wales; and *A critical revision of the genus Eucalyptus*, parts 1–3, 1903, also by Mr. Maiden, from the author; *Mann, The Tea soils of Cachar and Sylhet*, 1903, from the Secretary of the Indian Tea Association, Calcutta; *Micheli, Leguminosae Langlasseanae*, 1903, from Madame Micheli; *Map of the Republic of Peru*, 1903, from the Consul of Peru, Southampton; *Rodway, The Tasmanian Flora*, 1903, from the Hon. the Treasurer for Tasmania; *Spoerry, Die Verwendung des Bambus in Japan*, etc., 1903, from Sir W. T. Thiselton-Dyer, K.C.M.G.; *Theobald, First report on Economic Zoology*, 1903, from the Trustees of the British Museum; *Watt & Mann, The Pests and Blights of the Tea Plant*, ed. 2, 1903, from the Reporter on Economic Products to the Government of India; *Warburg, Baum's Kunene-Sambesi Expedition*, 1903, from Mr. J. G. Baker; *Bollettino agricole e commerciale della Colonia Eritrea*, 1903, from Dr. J. Baldrati; 10 original sketches of Australasian (chiefly New Zealand) Trees, by W. Swainson, from Miss Quinan. The following works have been presented by their respective authors: *E. A. L. Batters, A catalogue of the British Marine Algae*, 1902; *E. Boulanger, Germination de l'Ascospore de la Truffe*, 1903, and

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Les mycelium truffiers blancs, 1903; *F. Chauvel, Recherches sur la famille des Oxalidacées*, 1903; *A. Cogniaux, Petite Flore de Belgique*, ed. 3, 1895, and *Éléments de sciences naturelles . . . Botanique*, ed. 12, 1901; *J. A. Dominguez, Datos para la Materia Médica Argentina*, i., 1903; *J. F. Duthie, Flora of the Upper Gangetic Plain*, etc., part 1, 1903, 2 copies; *Sir W. T. Thiselton-Dyer, Morphological notes*, i.-x.; *N. Gustasp, Das Stockholz*, 1903; *A. von Huegel, Charles von Huegel, 1795–1870*, 1903; *T. Ito, New lessons in elementary Botany* [1903 ?]; *B. Kotô & S. Kanazawa, A catalogue of the romanized geographical names of Korea*, 1903; *O. Lignier, Le fruit du Williamsonia Gigas, Carr., et les Bennettitales*, 1903; *U. Martelli, Le collezioni di G. E. Rumpf acquisate dal Granduca Cosimo III. de Medici*, 1903; *E. D. Merrill, Botanical work in the Philippines*, 1903; *F. Niedenzu, De genere Heteropteryge*, 1903; *A. Rehder, Synopsis of the genus Lonicera*, 1903; *F. Sander & Co., Addenda to Sander's Orchid Guide*, 1903; *C. S. Sargent, The Silva of North America*, supplement vol. xiv., 1902; *H. Schinz, Versuch einer monographischen Übersicht der Gattung Sebaea*, 1903, and other papers; *M. J. Teesdale, The Trees of Dulwich*, 1902; *A. Whyte, Report . . . on . . . travels along the sea-coast belt of the British East Africa Protectorate*, 1903; the continuation of *Natal Plants*, by *J. Medley Wood*, also from the author. The continuations of several periodicals have been received from Sir J. D. Hooker, G.C.S.I. Mention should also be made of the numerous pamphlets which have mostly been presented by their respective authors, including Prof. G. Arcangeli, Mr. W. W. Ashe, Dr. I. Baldrati, Prof. A. Cogniaux, Dr. W. C. Coker, Prof. E. Hackel, Dr. F. B. Power, Prof. F. Ramaley, and Prof. C. S. Sargent, and of the numerous publications of the United States Department of Agriculture which have been presented by the Secretary of Agriculture.

Presentations to the Library during 1904.—The numerous presentations by the Bentham Trustees include: *Burgess, Eidodendron, views of the general character and appearance of trees*, 1827–31; *Drapiez, Herbier de l'amateur de fleurs*, etc., 1828–35, 8 vols.; *Hofland, A descriptive account of the mansion and gardens of White-Knights*, 1820; *Markham, A way to get wealth*, etc., 1683–84; *Mattioli, Herbář aneb Bylinář*, 1596, a Bohemian edition of Mattioli's well-known work, by Huber and Adam; *Nova Acta Academiae Caesareae Leopoldino-Carolinae Naturae Curiosorum*, vols. xxvi. pars. 2 to vol. lxxix., 1858–1901; *Cordus, Annotationes in Pedacii Dioscoridis Anazarbei de medica materia libros v.*, etc., 1561; *C[hambers], An olde thrift newly revived*, 1612; *Cook, The manner of raising, ordering, and improving forest trees*, ed. 2, 1717; *Hollós, Gasteromycetes Hungariae*, 1904; *Oltmanns, Morphologie und Biologie der Algen*, Bd. i., 1904; *Colgan, Flora of the County Dublin*, 1904; *Townsend, Flora of Hampshire*, ed. 2, 1904; *Wooster, Alpine Plants*, 1874, 2 vols.; *Kane, Arctic explorations in the years 1853–55*, 1856–57, 2 vols.; *Pinto, How I crossed Africa from the Atlantic to the Indian Ocean*, 1881, 2 vols.; also the continuation of about 20 serial publications. Sir W. T. Thiselton-Dyer, K.C.M.G., has presented

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a large number of selected tracts from his own library, and the following: *André, L'art des jardins*, 1879; *Bartlett, The history and antiquities of the parish of Wimbledon*, 1865; [*Casey*], *Riviera Nature Notes*, 1898; *Engelmann, De Antholysi prodromus*, 1832, a dissertation; *Lawson, The agriculturist's manual*, 1836; *Pictorial Handbook of London*, 1854; *Abstracts of the papers printed in the Philosophical Transactions*, vols. i.–vi., 1832–54, and the continuation as *Proceedings of the Royal Society of London*, vols. vii.–xxx., 1856–80. The following works from the library of the late Mr. Hermann Herbst were presented by Mr. Geo. Nicholson: *Benary, Album Benary* [28 coloured plates of cultivated vegetables], 1876–82; *Bowler, South African Sketches*, 1854; *Eeden, Album van Eeden . . . coloured plates of . . . Bulbous Plants*, 1872–81; *Petit, Parcs et jardins des environs de Paris*, [s.a.]; *Pitot, Arbres de l'île Maurice*, [s.a.], a collection of 21 plates by Pitot and others; and handbooks of the World's Columbian Exhibition at Chicago in 1893, of the Exhibition Building at Melbourne, and of North Carolina and Oregon. Sir J. D. Hooker, G.C.S.I., has presented a number of tracts; the continuation of several periodicals; *Rein, Beiträge zur Kenntnis der spanischen Sierra Nevada*, 1899; and the volume published by the Reale Accademia dei Lincei, Rome, in commemoration of the tercentenary of its foundation. Prof. Hans Schinz has presented 24 dissertations, and 3 have been received from Prof. Hans Solereder. Kew is indebted to Mr. H. S. Thompson for the 4 following publications: *Dunn, A preliminary list of the alien Flora of Britain*, 1903; *Ralfs, The British Phœnogamous Plants and Ferns*, 1839; *Sörensen, Norsk Flora*, 1896; and *Transactions of the Worcestershire Naturalists' Club*, 1847–99. *Scritti botanici pubblicati nella ricorrenza centenaria della morte di C. Allioni*, 1904, was received from Prof. Mattirolo; *Bigeard, Petite flore mycologique*, 1903, from Messrs. Dulau & Co.; *Bolus and Wolley-Dod, A list of the Flowering Plants and Ferns of the Cape Peninsula*, 1903, from Dr. H. Bolus; *Coville and Macdougal, Desert Botanical Laboratory of the Carnegie Institution*, 1903, from Prof. F. V. Coville; *Index Kewensis*, suppl. 2 (part 1), 7 copies, from the Delegates of the Clarendon Press, Oxford; *Plantae novae vel minus cognitae ex herbario horti thenensis*, 1 re [–2 me] livraison, and the continuation of *Plantae selectae horti thenensis*, from Monsieur L. van den Bosch; the continuation of the botanical publications of the Musée du Congo, from the Secrétaire Général du Département de l'Intérieur, Brussels; *Lelievre, Nouveau jardinier de la Louisiane*, 1838, from Mr. W. Beer; *Catalogue of the books . . . in the British Museum (Natural History)*, vols. i.–ii., 1903–04, and *The History of the Collections contained in the Natural History Departments of the British Museum*, vol. i., 1904, from the Trustees of the British Museum; *Macknight, Food for the Tropics*, 1904, from Messrs. W. Thacker & Co.; *Schlich's Manual of Forestry*, vol. ii., ed. 3, 1904, from the Registrar and Superintendent of Records, India Office; *Niles, Bog-trotting for Orchids*, 1904, from Messrs. Putnam; *First Report of the Wellcome Research Laboratories of the Gordon Memorial College, Khartoum*, 1904, from the Director; *Annals of the Kilmarnock Glenfield Ramblers' Society*, 1893–1904, from Mr. D. Murray through Dr. A. Henry; *Recueil des Travaux*

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Botaniques Néerlandais, No. 1, 1904, from the Société Botanique Néerlandaise; *Roxburgh, Flora indica*, a copy of the manuscript containing the Cryptogams as well as the Phanerogams, from Mr. Douglas M. Govan and Major-General C. M. Govan. The following have been presented by their respective authors: *R. T. Baker, Botanical papers on the Australian Flora*, 1904; *C. Beadle, Chapters on papermaking*, vol. i., 1904; *G. E. C. Beauvisage, Genera montrouzierana plantarum Novae Caledoniae*, 1901, and *Guide des étudiants au jardin botanique de la Faculté de Médicine et de Pharmacie de Lyon*, ed. 4, 1903; *F. O. Bower, Studies in the morphology of spore-producing members*, part 5, 1903; *P. T. Cleve, A treatise on the Phytoplankton of the Atlantic and its tributaries*, 1897; *E. J. Cole, Grand Rapids Flora*, 1901; *De Wildeman, Notices sur des plantes utiles ou intéressantes de la Flore du Congo*, fasc. i., 1903; *A. Farmar, Place-name synonyms classified*, and *Place-name correspondences*, 1904; *W. Fawcett, Guide to the Botanic Gardens, Castleton, Jamaica*, 1904; *P. Fitzgerald, A handbook to Kew Palace*, [s. a.]; *B. P. G. Hochreutiner, Le Sud-Oranais*, 1904; *W. H. Johnson, The cultivation and preparation of Pará Rubber*, 1904; *D. M. Mottier, Fecundation in Plants*, 1904; *D. Prain, Bengal Plants*, 1903, 2 vols.; *A. B. Rendle, The classification of Flowering Plants*, vol. i., 1904; *L. Sodiro, Contribuciones al conocimiento de la flora ecuatoriana, Monografias ii.–iii.*, 1903. The publications of the Bureau of Government Laboratories of the Philippine Islands have been received from the Superintendent and Mr. E. D. Merrill, those of the Botanic Garden, Buitenzorg, from Dr. M. Treub, and a selection of those of the United States Department of Agriculture, from the Secretary of Agriculture. Amongst the numerous donors of pamphlets may also be mentioned Dr. A. Baldacci, Prof. H. G. Hallier, Prof. A. S. Hitchcock, Mrs. Olga Fedtschenko, Mr. Boris Fedtschenko, and Prof. O. Lignier.

Liberia.—The Library of the Royal Botanic Gardens is indebted to its author for a copy of this work.* This gift is but the latest manifestation of Sir Harry Johnston's great and unfailing generosity to Kew.

The work gives an extremely interesting account of the history of the territories that are included in the Republic of Liberia and of the progress and present condition of the State.

The physical features, climatic conditions and natural history of Liberia are fully discussed and amply illustrated. The part devoted to the flora, which is that in which the readers of the *Bulletin* are more immediately interested, consists of about 150 pages with 58 illustrations, chiefly of useful plants, with a sprinkling of peculiar and new types, partly from Sir Harry's own drawings, partly from Miss Matilda Smith's pen and ink sketches. It opens with an interesting chapter by Sir Harry on the aspects, composition, uses, etc., of the vegetation. This is followed by a briefly descriptive enumeration of all the phanerogams and higher cryptogams at present known to inhabit

* Liberia: By Sir Harry Johnston, G.C.M.G., K.C.B., D.Sc. With an Appendix on the Flora of Liberia by Dr. Otto Stapf, F.L.S., 2 vols. London: Hutchinson & Co., 1906.

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the country, by Dr. Otto Stapf. Of course it can only be regarded as a fragment, some natural orders that almost certainly occur in Liberia not being represented in the collections, whilst other groups are very poorly represented. Of ferns, for example, only four species are enumerated and only seven orchids. But this fragment will doubtless be very useful, as it includes a large percentage of plants of economic value. Altogether about 540 species are enumerated, belonging to ninety natural orders. The orders most numerously represented are :—*Leguminosae*, 60 species; *Rubiaceae*, 50; *Apocynaceae*, 38; *Cyperaceae*, 29; and *Gramineae*, 25 species. Mr. Alexander Whyte's collection was by far the largest, and the consolidated collection yielded four new genera and about seventy new species mostly described in the 37th volume of the *Journal of the Linnean Society*. Mr. Whyte paid special attention to rubber-yielding plants, especially those belonging to the order *Apocynaceae*; the most important are accurately figured.

Botanical Magazine for July.—The plants figured are: *Euphorbia procumbens*, Mill., *Deutzia Wilsoni*, Duthie, *Paphiopedilum glaucophyllum*, J. J. Smith, *Gurania malacophylla*, Cogn., and *Genista cinerea*, DC. The *Euphorbia* is a dwarf, succulent, South African species, allied to *E. Caput-medusae*, Linn., but differs in having brightly coloured lobes to the involucres. The specimen figured is in the possession of Mr. Justus Corderoy, of Didcot. *Deutzia Wilsoni* is a free-flowering new species from Western China, differing only very slightly from *D. discolor*, Hemsl. The material from which the drawing was prepared was supplied by Messrs. J. Veitch & Sons. *Paphiopedilum glaucophyllum*, a recent introduction from Java, resembles the well-known *P. chamberlainianum*, Pfitzer, from which it is distinguished by having uniformly coloured, glaucous and broader leaves, and pubescent petals. The Kew plant was purchased from Messrs. F. Sander & Sons. It remains in flower for a long time. *Gurania* is a curious cucurbitaceous genus, the species of which are usually, if not always, dicœcious, and mostly, as in the case of *G. malacophylla*, known only in the male form. This species is a native of the Upper Amazons, and was figured from a specimen communicated by Mr. Ed. André, who had it in cultivation as *G. eriantha*, Cogn., a species with a spicate, not a globose, inflorescence. The *Genista* is a small, free-flowering shrub, "a characteristic constituent of the bush vegetation and the underwood of the forests of the western Mediterranean region." It has been in cultivation for many years, but is apparently not well-known.

Flora of Tropical Africa.—With the issue of Part III. of Section 2 the fourth volume of the Flora of Tropical Africa has been completed. It contains the conclusion of the *Scrophulariceae* (pp. 385–466) by Mr. W. B. Hemsley and Mr. S. A. Skan, the *Orobanchaceae* (pp. 462–468), *Lentibulariaceae* (pp. 468–499) and *Pedalineae* (pp. 538–570) by Dr. O. Stapf, the *Gesneraceae* (pp. 499–512) by Mr. J. G. Baker and C. B. Clarke, and the *Bignoniaceae* (pp. 512–538) by Mr. T. A. Sprague, and "Addenda" (pp. 571–575).

The Tropical African genera of *Scrophulariaceae* are now brought up to 54 with 368 species. In this part 29 species of

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Scrophulariaceae are described for the first time, by Mr. Skan, but no new genus is added. There are four genera recorded which are endemic in tropical Africa, but two of them are very closely allied to other genera of wide distribution. On the other hand the number of non-endemic species is surprisingly small. The tribe *Gerardieae*, most species of which are treated in this part, numbers not less than 179 species or about one-half of all the tropical African *Scrophulariaceae*. This is noteworthy as probably most of them are more or less parasitic. This circumstance no doubt also accounts for their absence from our greenhouses, which not a few of them would adorn on account of their brilliant flowers. To show the enormous extension of our knowledge of the flora of tropical Africa during the last 25 years, it may be worth mentioning that almost two-thirds (62·8 per cent.) of the Tropical African species of this family have only become known since the beginning of 1881. This is a family which with few exceptions does not attract the collector very particularly.

The *Orobanchaceae* comprise only two genera, with seven species, none of them endemic in tropical Africa.

The *Lentibulariaceae* number 38 species in two genera: *Utricularia* (with 35 species) and *Genlisea*. The principal interest is, of course, in their very peculiar morphology and œcology; but one species which differs from all the Old World Utricularias in that it grows in rapid streams and is destitute of bladders, is also remarkable in so far as its only near ally lives under similar conditions in Brazil.

The *Gesneraceae*, so abundantly developed in South-Eastern Asia, are very scantily represented in tropical Africa, where only seven genera, with 33 species, are known. They are, however, geographically interesting. Four genera (three of them monotypic) are endemic in tropical Africa, inhabiting mostly very limited areas, whilst a fifth genus (*Streptocarpus*, with 23 species) extends beyond tropical Africa only as far as extra-tropical South Africa and Madagascar.

The *Bignoniaceae* comprise ten genera, with 38 species, of which seven (species of *Kigelia*) are new. All the genera with the exception of two, which extend into the Indo-Malayan region, are African. The general tendency of the order towards differentiation into small genera is also evident in the African *Bignoniaceae*, only one genus (*Kigelia*) numbering more than five species.

The *Pedalineae*, an order limited entirely to the Old World, are represented by 12 genera, with 53 species, most of which are endemic in tropical Africa. Of the genera, only two extend beyond Africa, being represented by a very few species in Southern India. Out of the 53 species described here, 33, or almost two-thirds, have only become known within the last 25 years. The order is remarkable on account of the great diversity of the structure of the fruit; but many species also possess handsome and often curiously shaped flowers, and might with advantage be introduced into cultivation. The best known member of the order—the Sesame plant (*Sesamum indicum*)—may

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now, from its distribution in Africa, and its close relationship to species endemic in Africa, almost with certainty be considered as of African origin.

Botanical Survey of Tropical Africa.—The conclusion of the fourth volume of the *Flora of Tropical Africa* affords an opportunity for briefly summarising the whole of its contents with regard to the progress which it marks in the botanical survey of tropical Africa.

When, in 1891, it was decided to resume the preparation of the *Flora of Tropical Africa*, one volume was assigned to the orders *Oleaceae* to *Pedaliaceae*. of Bentham and Hooker's "Genera Plantarum." At that time the number of species of those orders recorded as occuring in tropical Africa might have been estimated at somewhat over 700. Volume III. contains 1,134 species. Allotting to volume IV. approximately the same number of species, there was therefore a margin for 400 additional species, corresponding to an increase of 60 per cent. But so extraordinary was the accession of new material during the progress of the preparation of volume IV., that in the end the number of species of the orders reserved for it rose to 2,176, double the original estimate. That, of course, necessitated the subdivision of the volume into two parts, each equalling in size an ordinary volume. The increase was very unequal in different orders—as will be seen from the list given below—varying in the larger orders (of over 100 species) from slightly over 50 per cent. in *Solanaceae* to well over 300 per cent. in *Apocynaceae*, and almost 600 per cent. in *Loganiaceae*. The significance of these figures will perhaps more readily be grasped when we consider that the increase from 813* species known before 1891 to 2,176 known at present means that for every three species then known, five species have since been added; and if we assume that the same proportions hold good in the case of the orders dealt with in the first three volumes of the *Flora of Tropical Africa*, these orders would, if worked out at present, fill at least eight volumes. That this is by no means an exaggerated view may be seen from the fact that the Tropical African *Myrsinaceae* and *Sapotaceae*, which in the third volume (1877) numbered 11 and 23 species respectively, are, in recently published monographs, represented by 36 and 92 species respectively.

This phenomenal increase of our knowledge of the flora of Tropical Africa since 1891 has been due to several causes. Old collections of very considerable extent which had only casually and partially been studied have now been worked up systematically (*e.g.* Barter's West African, Schweinfurth's Sudan, and Welwitsch's Angola collections); fresh collections have poured in as new countries were opened up or the establishment of botanical

* These figures include a number of species which, although known prior to 1891, were not recorded from tropical Africa until after 1890. To make out their exact number would have taken more time than could reasonably be spared; but it probably does not exceed 70 or 80, so that the species of the orders in question which were known from tropical Africa at the end of 1890 may be estimated as somewhat over 700.

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stations in the older colonies facilitated a more exhaustive exploration of their neighbourhood; finally it was just then that Germany started with remarkable and well directed energy on the botanical survey of her colonies, with the result that in not a few orders 50 per cent or more of all the additions from recent collections are due to her enterprise.

The following table shows the increase in new species since 1891, distributed over the orders dealt with in volume IV. :—

—	Species known previous to 1891.	Species known since 1891.	Total.
Vol. IV., Sect. 1. (*issued Nov.* 1904).			
Oleaceae	14	52	66
Salvadoraceae	3	2	5
Apocynaceae	75	259	334
Asclepiadaceae	131	293	424
Loganiaceae	21	123	144
Gentianaceae	29	71	100
Vol. IV., Sect. 2. (*issued June* 1906).			
Hydrophyllaceae	6	1	7
Boraginaceae	74	64	138
Convolvulaceae	132	154	286
Solanaceae	89	46	135
Scrophulariaceae	154	216	370
Orobanchaceae	5	—	5
Lentibulariaceae	25	13	38
Gesneraceae	12	21	33
Bignoniaceae	18	20	38
Pedaliaceae	25	28	53
Total	813	1,363	2,176

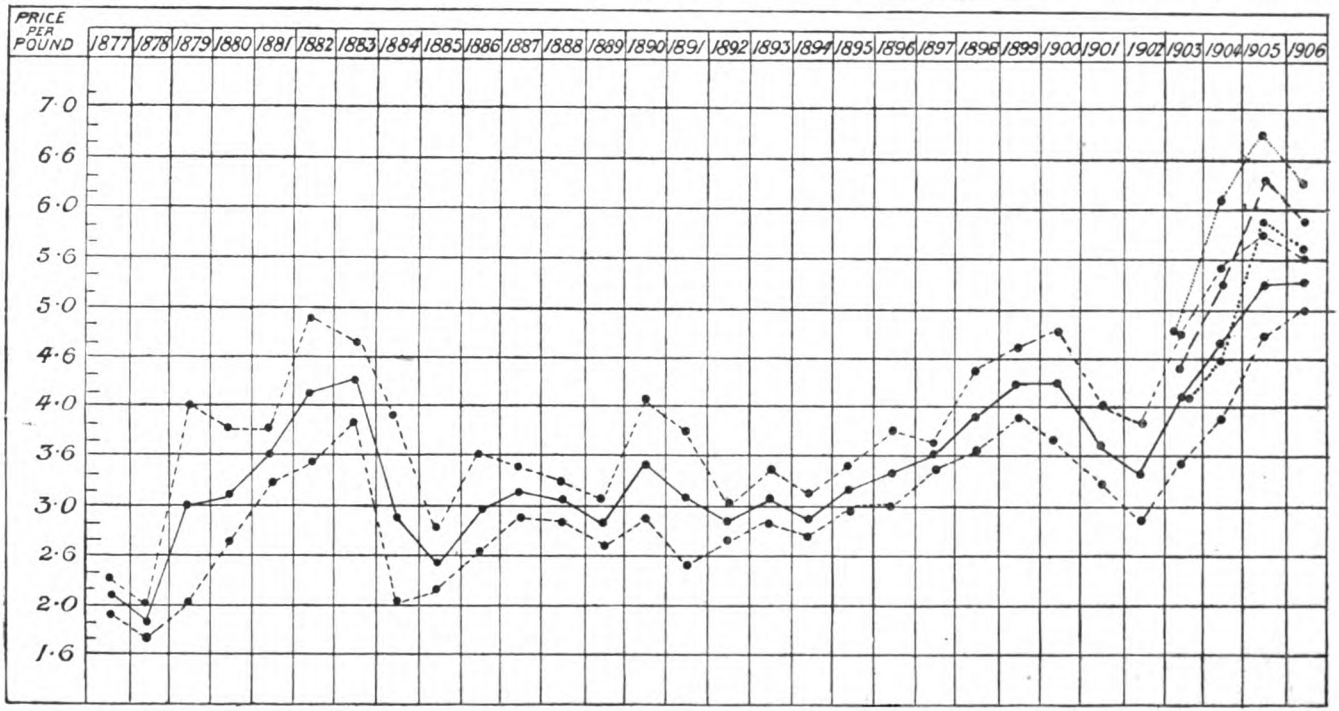
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PRICES OF FINE PARA RUBBER DURING EACH YEAR FROM 1877 TO 1906 INCLUSIVE IN LONDON AND LIVERPOOL AND OF CULTIVATED PARA (CEYLON & STRAITS SETTLEMENTS) FROM 1903 TO 1906 INCLUSIVE (COMPILED FROM THE LISTS OF MESSRS HECHT, LEVIS & KAHN)



Fine Para { Average ——— / Maximum and Minimum - - - - -

Cultivated Para { Average — — — / Maximum and Minimum

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ROYAL BOTANIC GARDENS, KEW.

BULLETIN

OF

MISCELLANEOUS INFORMATION.

No. 7.] [1906.

XXXIX.—PARA RUBBER.

(*Hevea brasiliensis*, Muell. Arg.)

THE RISE AND FALL IN PRICES OF THE FOREST PRODUCT FOR THE PAST 30 YEARS AND OF THE CULTIVATED FORM FOR THE PAST 4 YEARS.

In the *Kew Bulletin* for 1898 a chart was published shewing the average prices of fine Para rubber (*Hevea brasiliensis*), for the years 1877 to 1898 inclusive, and in view of the constantly increasing importance of the rubber industry it has been considered expedient to bring this up to date. A graphical writing should explain itself, and without entering on too great detail it will be observed that the general tendency has been an upward one, although some of the variations are rather remarkable. At no period has the price remained fixed throughout any particular year, the nearest approach to this occurring in 1897 with a range of 3*d*. only; the greatest deviation from it in 1879 with a range of 2*s*. The figures, maximum, minimum, and average, in all instances, are given minus fractions of a penny.

Some explanation is necessary in connection with the lines for cultivated or plantation Para rubber, which so far appears to have come exclusively from Ceylon and the Straits Settlements. The history of the industry in respect of these Colonies has been fully discussed in previous issues of the *Bulletin*, and it will, perhaps, be unnecessary here to do more than point out that the plantation rubber, according to statistics, first began to appear in marketable quantities in 1903, although exports on a smaller scale from Ceylon were made in 1901 (*Ceylon Administration Reports*, 1901, part iv., p. H 2, Roy. Bot. Gardens). Samples had been submitted as early as 1882 from there (*Kew Bulletin*, 1898, p. 255), and in 1898 from the Straits Settlements (*Kew Bulletin*, 1898, p. 274; and 1899, p. 22). On this subject it

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may also be of interest to quote the following letter from the Straits' *Agricultural Bulletin* (Vol. ii., 1903, p. 193), which, together with the accompanying chart, will give a fair idea as to their relative positions and to the trade in general at that date (1903).

"36, Fenchurch Street,
"London, E.C.,
"7th April, 1903.

"Harold Tunnicliffe, Esq.,
"Atherton Estate, Port Dickson,
"Straits Settlements.

"DEAR SIR,

"We duly received your favour of the 8th March with sample of rubber grown from Para seed. There are fair quantities of similar rubber beginning to come from Ceylon and they find a ready market. The sample which you send us seems to be of very good quality, tho' perhaps a trifle 'tacky' which, however, may be due to the way in which the sample has been sent and may not be the case in bulk. In to-day's market, which is a good one, we should think a parcel of this rubber would fetch from 4*s.* 3*d.* to 4*s.* 5*d.* per lb., and our idea of the immediate future of the article, anyhow until next autumn, being a favourable one, we don't think that a shipment on the basis of our valuation will lead to disappointment.

* * * * * *

"(Signed) Hecht, Levis and Kahn."

As shewing the improvement on the beginning referred to in the above letter, it is stated that "the most remarkable development in Ceylon Agriculture during 1905 was the planting of rubber, under which there were at the end of 1905 some 40,000 acres as compared with 11,000 in 1904 and 7,500 in 1903, and the value of rubber exported in 1905 was Rs. 557,945 as compared with Rs. 221,000 in 1904." (Colonial Report, No. 494, Ceylon, 1906, p. 23.)

It remains to be seen how soon, and to what extent, the West Indies, West Africa, and other Colonies that have taken up the cultivation of this product, will meet the requirements of the market.

J. H. H.

XL.—PLANT DISEASES: VI.—POTATO LEAF-CURL.

(*Macrosporium solani*, Cooke. Syn., *M. tomato*, Cooke.)

Symptoms indicating the presence of this disease are very pronounced. In what may be termed a mild attack, which usually manifests itself only after the haulm is nearly full-grown, the leaves change to a sickly yellowish green colour and afterwards curl up at the edges; the haulm soon afterwards becomes limp, and finally droops. If the course of the disease is carefully followed it will be observed that the lowest leaves are attacked first, the disease gradually ascending the haulm until all the leaves are involved. When the haulm collapses there is

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usually no external evidence of the presence of the fungus, but if the tissues are examined microscopically an abundance of mycelium will be met with. When the haulm and leaves are dead or nearly so, the fruit of the fungus appears in abundance; on the leaves it forms minutely velvety blackish-olive patches of variable form and size, whereas on the haulm it appears under the form of long thin streaks. The difference in superficial appearance between the broadly effused patches on the foliage, and the long narrow streaks on the stem, has led to the supposition that two distinct parasites are present. The supposition is a mistaken one, only one parasite is present; the difference between the appearance on the leaves and stem respectively is a matter of mechanics and not of species. On the stem the fruit of the fungus can only break through to the surface between the parallel rows of vascular bundles, hence the long, narrow streaks; whereas the arrangement of the veins in the leaf admits of the fruit appearing in extended patches.

In an acute attack the haulm is stunted from the first, and rarely attains to a length of six inches, the leaves also remain quite small and are much curled. In such cases no new tubers are formed. Sometimes the "sprouts" are killed outright in the youngest stage before they appear above-ground. In such an instance if the "set" is examined it will be found to be quite firm and apparently practically unchanged.

It has already been explained elsewhere that "leaf-curl" is perpetuated from year to year by the presence of mycelium in the tuber (*Kew Bulletin*, 1906, p. 110; *Journ. Board Agric.*, September, 1906). When a tuber infested with mycelium is planted, the mycelium grows along with the stem and enters the leaves; it also passes into the young tubers. When a tuber is only slightly infested with mycelium, it follows the course indicated, and its further behaviour as to remaining in a subordinate condition in the tissues of the potato plant, and doing little harm beyond infecting the new tubers; or whether it assumes a rampant form and destroys the above-ground portion of the potato plant, depends almost entirely on weather conditions.

On the other hand when a tuber is badly infested with mycelium it is often completely dead before it is planted. If not quite killed it may produce the dwarfed growth already described. As the fungus mycelium does not destroy the starch, but only the proteid substance, it is practically impossible by any superficial method to determine whether a tuber is killed or not. This can only be determined by a microscopic examination.

Owing to the fact that the conidia of the fungus are only produced on dead or dying plants, and mostly in the autumn, the epidemic is not increased by healthy plants having their foliage infected by the conidia produced on diseased plants, as in the case with "potato disease" caused by *Phytophthora infestans*, De Bary. Quite young shoots have been infected, late in the season, with conidia obtained from dead plants of the same year, but the infection remained local and did not extend backwards down the haulm, hence the young tubers could not be infected with mycelium.

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From the statements made it will be gathered that infection can only take place through the tuber. This can be effected in two ways; from a previously diseased tuber that has been used as a "set," or from conidia present in the ground. The latter method implies the previous growth of a diseased crop on the same land. In either case when a tuber once contains the hybernating mycelium of the fungus, the probability is that its offspring will be infected for all time, the mycelium passing from one generation to another. This statement however is not absolute. Last year tubers obtained from potatoes badly affected with "leaf-curl" were planted in the experimental ground adjoining the Jodrell Laboratory at Kew, and every plant showed the disease in every part. The tubers produced by this crop were planted again this year, and although every plant is obviously diseased, one root bearing four haulms has one haulm very badly diseased, the other three being perfectly healthy. Another root with five haulms has two diseased, the remaining three healthy. All the other plants are diseased throughout. The probable explanation of this is that for some unknown reason, the mycelium present in the tuber did not pass up into the shoots that remained free from disease.

The blackish patches that appear on diseased leaves and haulms consist entirely of conidia or reproductive bodies of the fungus, which originate from the dense weft of mycelium present in the tissues of the potato plant. The conidia are comparatively large, dark coloured, and when mature are divided into several cells by walls developed more or less at right-angles to each other. When once mature these conidia will germinate readily during any period of the year, provided the requisite conditions are present. In a state of nature, however, it so happens that such conditions are not forthcoming at all seasons, but only during that period which coincides with the growth of young potato tubers. The two factors necessary for the vigorous germination of conidia are, a given temperature and the presence of moisture. A series of experiments show that the *minimum* or lowest temperature at which coinidia will germinate in a manner sufficiently vigorous to effect inoculation is 47° F. This prevents the majority of conidia produced on the dead leaves and haulms in autumn from germinating until the following season. The *optimum*, or most suitable temperature for germination is 64° F. The *maximum*, or highest temperature for healthy germination is 78° F. The rate of germination at the optimum temperature of 64° F. is twice as rapid as at minimum or maximum temperature. In twelve hours many very long, much branched germ-tubes are produced, and within twenty-four hours numerous secondary conidia are produced on the germ-tubes. These secondary conidia are produced in chains simulating the form-genus *Alternaria*. In cultures of germinating conidia, when the food becomes exhausted, the contents of the germ-tubes concentrate at intervals into small masses which become surrounded by a thick wall, and are practically chlamydospores or resting-spores, which can only be induced to germinate after a period of rest. Such resting-spores have germinated after having been kept in the laboratory for six months in a perfectly dry condition, and it is quite probable that such resting-spores may remain in the soil from one season to another without losing their power of germination.

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The dependence on favourable conditions as to temperature and other factors, influencing the germination and power of infection of conidia present in the soil; also the dependence on weather of the relative growth of mycelium in an infected tuber, serve to explain why the disease is much more prevalent during some seasons than others, also why during certain seasons there is practically no disease present.

Experiments prove that tubers can only be infected during the earliest stage of growth; when the tuber has reached the size of a marble and a definite periderm or skin is formed, it is free from danger.

Judged from a morphological standpoint the relationship of the fungus causing "leaf-curl" to that of another fungus—*Macrosporium tomato*, Cooke, parasitic on cultivated tomatoes, was some years ago indicated as follows:—"This fungus is closely allied to, if not identical with the *Macrosporium* causing black stripe, or blotch on the tomato" (*Text-book of Plant-diseases*, p. 323). Inoculation experiments have proved this supposition to be correct. Conidia produced on a potato plant will infect a tomato and *vice versâ*. The discovery facilitates matters to the extent of deleting one supposed parasitic entity, and also indicates the danger of the disease passing from one crop to the other when the two are growing in close proximity.

The practical deductions to be derived from the foregoing remarks are as follows:—

Potato tubers for planting should be obtained from a district free from disease.

Potatoes should not be planted, for a period of three years, on land that has produced a diseased crop.

Diseased haulms should be collected and burned or deeply buried. This is important, otherwise the land will become infected.

Diseased tomato stems and fruit should be dealt with as above, otherwise the potato crop may suffer.

XLI.—DIAGNOSES AFRICANAE: XVIII.

864. **Guarea Thompsoni**, *Sprague et Hutchinson* [Meliaceae]; ab affini *G. Zenkeri*, Harms, inflorescentia pyramidali recedit.

Arbor ramulis glabris 1 cm. diametro vel ultra. *Folia* 7–8-juga, glabra; petiolus circa 8 cm. longus, semiteres, marginibus paullo inflexis; foliola oblonga vel obovato-oblonga, rarius oblanceolata, 10–20 cm. longa, 4·5–7·5 cm. lata, apice obtusa, interdum brevissime acuminata, nonnunquam retusa, basi rotundata vel obtuse cuneata, chartacea, utrinque opaca, venis et venulis supra inconspicuis, subtus prominulis, lateralibus utrinque 11–14 patulis vel satis obliquis; petioluli 6–11 mm. longi, supra canaliculati. *Paniculae* axillares, plures versus apicem ramulorum dispositae, anguste pyramidales, 12–30 cm. longae, rhachi puberula; bracteae minutae, depresso-deltoideae; pedicelli 4–7 mm. longi, pubescentes. *Calyx* cupularis, 3 mm. altus, 4 mm. diametro, paullo quinqueundulatus potius quam lobatus, extra pubescens, intus glaber. *Petala* 5

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vel 6, imbricata, oblonga, basin versus angustata, apice rotundata vel obtusa, 8–10 mm. longa, circa 3 mm. lata, extra minute pubescentia, intus glabra. *Tubus staminalis* glaber, medio ventricosus, 7–7·5 mm. longus, apice 10–15-lobatus; lobi oblongi, 1·25–1·5 mm. longi, 0·5 mm. lati, apice breviter bifidi, lobulis obtusis; antherae 10–15, cymbiformes, tubo vix infra incisuras sessiles, 1–1·25 mm. longae, circa 0·5 mm. latae. *Ovarium* sessile, oblongum, 5 mm. longum, 1·5–2 mm. diametro, longe pilosum, 4–5-loculare, loculis 1 mm. supra basin sitis, biovulatis, ovulis inaequialte collateralibus pendulis, supra loculos cavum; stylus 2–2·5 mm. longus, glaber, stigmate peltato glabro 1·75–2 mm. diametro. *Fructus* desunt.

SOUTHERN NIGERIA. Benin City, *H. N. Thompson*, 16.

865. **Gymnosporia deflexa**, *Sprague* [Celastraceae]; ab affini *Celastro albato*, N. E. Brown, foliis majoribus lanceolato-ovatis pedicellis duplo longioribus recedit.

Arbor mediocris (fide *Grenfell*), vel magna (fide *Burtt-Davy*). *Ramuli* circa 20 cm. longi, inermes, leviter flexuosi, teretes, glabri, juniores pallide glauco-virides, superne compressi, seniores cinereo-corticati rugulosi, internodiis 1–4 cm. longis. *Folia* solitaria, lanceolato-ovata, apice obtusissima, basi cuneata, simpliciter vel subdupliciter dentato-serrata, tenuiter coriacea, supra pallide viridia vel glauco-viridia, venulis prominulis crebre reticulata, subtus albido-glauca venis satis prominentibus, venulis quam supra minus conspicuis; venae laterales utrinque 10–11; lamina 7–14 cm. longa, 3·5–6 cm. lata; petiolus circa 1 cm. longus, supra excavatus. *Flores* axillares, 10–30-fasciculati, pentameri; pedicelli 15–18 mm. longi, 5–6 mm. supra basin conspicue articulati. *Sepala* anthesi deflexa, ovato-oblonga, supra concava, 1–1·75 mm. longa, 1–1·25 mm. lata, submembranacea, apice vel usque medium ± brunneo-lacerata vel denticulata. *Petala* anthesi deflexa, elliptico-ovata, rotundata, subtus infra medium valde concava, apice inflexa, 4·75–5 mm. longa, circa 3 mm. lata. *Discus* annularis, 0·6–0·7 mm. latus. *Filamenta* 1·5 mm. longa; antherae suborbiculares, circa 0·7 mm. diametro. *Ovarium* triloculare, 1·25 mm. altum; stylus 0·5–0·75 mm. longus; stigmata 3 crassa; ovula pro loculo 2 erecta. *Capsula* depresse trigono-globosa, 6–8 mm. diametro, stylo persistente apiculata 2–3-sperma, valvis rigide coriaceis, minute elevato-punctatis. *Semina* castanea, arillo incompleto, irregulariter lobato et lacerato minute crenulato.

TRANSVAAL. Zoutpansberg: Woodbush, *Grenfell*, 4; *Grenfell in Transvaal Colonial Herbarium*, 1142; Patata bosch No. 2013, *Burtt-Davy in Transvaal Colonial Herbarium*.

According to Burtt-Davy, *G. deflexa* is common in the Mist-belt forest of the Houtboschberg (Zoutpansberg District) at altitudes of between 1400 and 1500 m. It is there known as "Saffraan-hout," on account of the yellow colour of its inner bark.

866. **Gymnosporia condensata**, *Sprague* [Celastraceae]; affinis *Celastro polyacantho*, Sond., cymis condensatis floribusque majoribus ab eo recedit.

Arbor parva. *Ramulus* unicus exstans 30 cm. longus, spinis validis armatus, subteres, glaber, pallide glauco-viridis, internodiis 0·7–2 cm. longis. *Folia* supra spinos fasciculata, oblanceolata vel

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anguste obovata, apice obtusa rotundata vel paullo emarginata, saepius mucronulata, versus basin sensim angustata, minute glanduloso-serrulata, chartacea, utrinque pallide glauco-viridia, venis et venulis supra occultis subtus prominulis, lateralibus utrinque circa 5; lamina 1·5–2·5 cm. longa, 6–8 mm. lata; petiolus 2-3 mm. longus, supra excavatus. *Cymi* densissimi, e spinis orti. *Flores* pentameri; pedicelli 3–3·5 mm. longi. *Sepala* anthesi patentia, suborbicularia, 0·5–1 mm. diametro, lacerato-denticulata, supra leviter concava, submembranacea. *Petala* tandem patentia vel paullo deflexa, elliptica vel ovato-elliptica, rotundata, 2·75–3·5 mm. longa, 1·75–2·5 mm. lata, minutissime denticulata. *Discus* annularis, 0·3–0·4 mm. latus. *Filamenta* 1·75–2·25 mm. longa, basi dilatata; antherae reniformes, 0·75 mm. diametro. *Ovarium* triloculare, 0·75 mm. altum; stylus brevissimus; stigmata 3, circa 0·5 mm. longa; ovula pro loculo 2 erecta.

TRANSVAAL. Olifant's River, *Hurley*, 1.

867. **Cissus adenopodus**, *Sprague* [Ampelidaceae]; a ceteris speciebus sectionis *Cyphostemmae*, subsectionis Planchonianae octavae, pedicellis conspicue glanduliferis, inflorescentia ceterum pilis ordinariis vestita recedit.

Planta herbacea, ope cirrhorum scandens. *Radix* tuberosa (fide *Dawe*). *Caulis* teres (exsiccatus costatus), ut petioli et petioluli cirrhique patule pilosus et pilis glandulosis paucioribus vestitus. *Folia* trifoliolata; petioli subteretes, 3–5 cm. longi; petioluli 4–7 mm. longi, medii quam laterales paullo longiores; foliola ovata, acute acuminata, grosse serrata, lateralia basi inaequaliter rotundata vel subcordata, 5–8 cm. longa, 3–4 cm. lata, terminale basi obtusum vel rotundatum, 7–10 cm. longum, 4·5–5·5 cm latum, utrinque setulosa, supra viridia venis in mesophyllo depressis (exsiccando prominulis), subtus rubida venis prominentibus (exsiccando paullo); venae laterales utrinque 5–6. *Stipulae* falcato-lanceolatae, acutae, 7–10 mm. longae, circa 3 mm. latae, extra pilosae. *Panicula* oppositifolia, plana, ambitu triangularis, 3·5 cm. pedunculata, circa 10 cm. longa, vivide rubra, patule pilosa, ramis alternis 0·5–1·5 cm. distantibus. *Bracteae* inconspicuae. *Pedicelli* circa 4 mm. longi, pilis glanduloso-capitatis paucis conspicuis et ordinariis brevibus inconspicuis induti, post anthesin recurvi. *Alabastra* circa 3 mm. longa, apice pilosa. *Calyx* cupularis, 0·75–1 mm. altus, basi puberulus. *Petala* oblonga, obtusa, apice 1–1·5 mm. cucullata, 4 mm. longa, vix 1·5 mm. lata, cucullo rubro extra longiuscule piloso, ceterum glabra viridia, anthesi valde deflexa. *Stamina* prima anthesi ad stylum appressa; filamenta circa 3 mm. longa; antherae late ellipticae, 0·75 mm. longae. *Ovarii* segmenta 0·75 mm. longa; stylus 2·5 mm. longus.

UGANDA. Busiro District, alt. 1200 m., *Dawe*, 224.

Roots of this species were collected by Mr. Dawe in the Mufukamata Forest and sent to Kew, where the plant flowered in the Succulent House in August, 1906. The young shoots and leaves are coloured bright red, and the species is in consequence rather decorative; the upper surface of the leaves soon becomes green, but the stems and the lower surface of the leaves change

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but little in colour. *C. adenopodus* does not appear to be nearly related to any *Cissus* hitherto described; perhaps its closest affinity is with *C. Buchananii*, Planch., which has, however, five leaflets and a very glandular inflorescence.

Besides the ordinary and gland-tipped hairs mentioned in the preceding description, a third kind is found on *C. adenopodus*, namely, "pearl-glands." They are present on the inflorescence, usually near the base of the pedicels, on the under surface of the young leaves, and on the outside of the stipules near the base. The view generally adopted nowadays is that pearl-glands are "food-bodies" for ants, at all events in many cases [see Penzig in Atti Congr. Bot. Internaz. 1892, p. 239; and Raciborsky in Flora, vol. lxxxv. 1898, p. 358].

868. **Schotia transvaalensis.** *Rolfe* [Leguminosae-Caesalpinieae]; affinis *S. brachypetalae*, Sond., sed caulibus juvenibus pubescentibus, foliorum rhachi anguste alata, foliolis minoribus submembranaceis, floribus minoribus, petalis exsertis differt.

Caules juvenes pubescentes. *Folia* abrupte pinnata; rhachis anguste alata, 5–6 cm. longa; foliola 4–6-juga, brevissime petiolata, elliptica vel obovato-oblonga, apiculata vel interdum emarginata, submembranacea, glabra, 1·5–3 cm. longa. *Stipula* semicordata, acuminata, 8 mm. longa. *Paniculae* axillares, pubescentes, circa 3 cm. longae, densiflorae. *Bracteae* brevissimae, truncatae. *Flores* breviter pedicellati, coccinei. *Calycis* tubus brevis; lobi obovati, obtusi, circa 1 cm. longi. *Petala* anguste obovata, unguiculata, circa 1·5 cm. longa. *Stamina* circa 2·5 cm. longa. *Legumen* oblongum, apiculatum, compressum, lignosum, circa 8 cm. longum. *Semina* 3, obovato-oblonga, compressa, nitida; testa reticulato-venosa; arillus latus, truncatus, circa 1 cm. longus, 1·2 cm. latus.

TRANSVAAL. Barberton, *P. P. Oranje.*

869. **Pentanisia Sykesii.** *Hutchinson* [Rubiaceae-Knoxieae]; affinis *P. Schweinfurthii*, Hiern, a qua calycis tubo glabro, stipulis et calycis lobis magis foliaceis recedit.

Herba rhizomate ascendente lignoso, e basi ramosa, circa 26 cm. alta, ramis subquadrangularibus infra stipulas linea pubescenti notatis. *Folia* sessilia, lanceolata, basin versus angustata, glabra, firma, apice acuta vel obtusa, 2·5–4 cm. longa, 0·5–1 cm. lata. *Vagina stipularis* usque ad 3 mm. longa, lobis 3-5 linearibus obtusis interdum subfoliaceis 3–10 mm. longis 0·5–2 mm. latis. *Cyma* bipara, primum capituliformis, ramis mox elongatis. *Calycis tubus* glaber, circa 2 mm. longus, lobis acutis admodum inaequalibus, 1 vel 2 eorum foliaceis lineari-oblongis 5–9 mm. longis 1–1·5 mm. latis, ceteris subulatis multo brevioribus. *Corollae tubus* extra pubescens, fauce extra glabrata circa 1 mm. diametro; lobi 5, oblongo-lanceolati, 5 mm. longi, 2 mm. lati, extra glabrati, intus minutissime pubescentes (fere papillosi). *Flores longistyli*—Corollae tubus 11 mm. longus, fauce dense barbata; stamina inclusa, 2 mm. infra sinus inserta, filamentis 1 mm. longis, antheris flavis 2 mm. longis; stylus 15 mm. longus, lobis stigmaticis 5 inaequalibus corollae tubum 4 mm. superantibus. *Flores brevistyli*—Corollae tubus 9 mm. longus, fauce laxius barbata; stamina longe exserta, 2 mm. infra sinus inserta, antheris

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caeruleis 2·5 mm. longis, filamentis 4 mm. longis; stylus 8–9 mm. longus, lobis stigmaticis 3–5 inaequalibus. *Ovarium* 4-5-loculare, ovulis solitariis, pendulis. *Fructus* ignotus.

RHODESIA. Batoka Plateau, near Katomo, *F. W. Sykes in Herb. Allen*, 225.

870. **Sphacophyllum flexuosum**, *Hutchinson* [Compositae-Inuloideae]; affine *S. Kirkii*, Oliv., a quo foliis majoribus inflorescentia laxa differt.

Planta circa 1 m. alta, ramis teretibus striatis circa 5 mm. diametro pilis moniliformibus tomentellis. *Folia* pinnatisecta, segmentis lateralibus 6–8 parvis; rhachis usque ad 4·5 cm. longa; segmentum terminale ovatum, obtusiuscule acuminatum, interdum subcordatum, dupliciter crenato-serratum, 8–14 cm. longum, 4–9 cm. latum, supra breviter puberulum, subtus dense breviter pubescens, basi subpalmatim 5–7-nervium; nervis utrinque praesertim infra prominulis: segmenta lateralia crenata, usque ad 15 mm. longa et 7 mm. lata. *Inflorescentia* corymbosa, circa 12 cm. longa; rhachis flexuosa, ramis 1–3 cm. distantibus; pedunculi usque ad 2·5 cm. longi. *Capitula* hemisphaerica, circa 1·5 cm. diametro. *Involucri bracteae* 3-seriatae, lanceolatae vel exteriores ovato-lanceolatae, acutae, minute glanduloso-pubescentes, ciliatae. *Flores radii* circa 30; tubus 3 mm. longus, extra glandulosus; lamina lutea, oblonga, emarginata, 8 mm. longa, 2·75 mm. lata; stylus glaber, ramis leviter apiculatis 0·75 mm. longis. *Flores disci* plurimi; tubus 3·5 mm. longus; lobi 0·75 mm. longi, extra glandulosi; antherae 2 mm. longae; stylus glaber, ramis apice rotundatis 1 mm. longis. *Paleae* 5 mm. longae, apice laciniatae. *Achaenia* cylindrica vel leviter costata, glabra, 1·5 mm. longa. *Pappus* annularis, minutissimus.

NYASALAND. Tuchila Plateau, alt. 1800 m., *Purves*, 87.

871. **Anisopappus Junodi**, *Hutchinson* [Compositae-Inuloideae]; affinis *A. africano*, Oliv., sed foliis dentatis nec crenatis, pedunculis brevioribus, capitulis angustioribus differt.

Frutex 1·5–2 m. altus, ramis striatis arachnoideo-tomentellis. *Folia* lanceolata vel ovato-lanceolata, 3·5–5 cm. longa, 1·5–2 cm. lata, supra minute subtiliter arachnoideo-pubescentia, demum glabra, subtus tomentella, marginibus obtuse dentatis, venis et venulis supra leviter impressis subtus prominentibus, lateralibus utrinque 3-4; petiolus 7–12 mm. longus, tomentellus. *Inflorescentia* corymbosa, 2–5 cm. longa; pedunculi usque ad 1·5 cm. longi, bracteis linearibus 5 mm. longis. *Capitula* circa 1 cm. longa et 0·5 cm. diametro. *Involucri bracteae* oblongae, obtusae, inaequales, extra dense tomentellae, 4–7 mm. longae, circa 1·5 mm. latae. *Flores radii* circa 20; tubus 3 mm. longus, extra minute glandulosus; lamina lutea, oblonga, 8 mm. longa, 2 mm. lata, apice breviter trifida; styli rami glabri, 1 mm. longi. *Flores disci* plurimi; tubus 4·5 mm. longus; antherae 2·5 mm. longae; styli rami glandulosi, 1 mm. longi. *Paleae* 7 mm. longae, apicem versus pilosae. *Achaenia* sparse pilosa, 2 mm. longa; pappi setae paucae, 1 mm. longae.

TRANSVAAL. Shilouvane, on the slopes of the mountain, *Junod*, 1279.

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872. **Schizoglossum altum**, *N. E. Brown* [Asclepiadaceae]; affine *S. strictissimo*, S. Moore, sed corolla intra glabra facile distinguitur.

Caulis ad 1·4 m. altus, superne uniramosus, velutino-puberulus. *Folia* erecta vel suberecta, inferiora 4–6 cm. longa, 1–1·5 mm. lata, superiora minora, linearia, acuta, marginibus revolutis, puberula. *Umbellae* ad nodos sessiles, 2–3-florae. *Pedicelli* 2–4 mm. longi, puberuli. *Sepala* 1 mm. longa, ovata, acuta, puberula. *Corolla* rotata, extra tenuiter pubescens, intra glabra, fusco-purpurea; lobi 2·5 mm. longi, 1·25 mm. lati, ovato-oblongi, subacuti, marginibus recurvis. *Coronae* lobi erecto-patentes, 0·5 mm. longi, 1 mm. lati, transverse cuneato-oblongi, basi connati, intra bicarinati et ad apicem appendicula lanceolata acuta 0·5–0·75 mm. longa antheris incumbente instructi.

BRITISH CENTRAL AFRICA. Nyasaland; Ntondwe, *Cameron*, 107.

873. **Asclepias fornicata**, *N. E. Brown* [Asclepiadaceae]; affinis *A. macranthae*, Hochst., umbellis racemosim dispositis et coronae lobis differt.

Caulis superne anfractuosus, unifariam puberulus. *Folia* 5–11 cm. longa, 2–4 mm. lata, linearia, acuta, glabra vel parce puberula. *Umbellae* pedunculatae, racemosim dispositae, 3–4-florae. *Pedunculi* subaequales, plerumque 5–7 cm. longi. *Pedicelli* 3–4 cm. longi. *Sepala* 5–6 mm. longa, 3 mm. lata, ovato-lanceolata, acuta, glabra. *Corollae* lobi erecto-patentes, 1·4–1·5 cm. longi, 8 mm. lati, elliptico-oblongi, subacuti, utrinque glabri. *Coronae* lobi supra basin columnae staminum inserti et columnam excedentes, erecti, 7 mm. longi, complicato-carinati, lateraliter subalati, a tergo visi oblongi, apice rotundati, supra carinas breviter producti, basi in stipitem brevissimum abrupte rotundati, a latere visi apice 4 mm. lati, carinis superne in dentes magnos falcato-oblongos supra antheras productis et transversim marginato-alatis, dorsaliter fornicatis, intra minute papillatis.

BRITISH CENTRAL AFRICA. Nyasaland; Mwanemba, 2400 m. *McClounie*, 81.

Although in general appearance this resembles *A. macrantha*, Hochst, except as to the disposition of the umbels, the coronal lobes are quite distinct from those of any other species I have examined, for instead of the cavity on the inner face being formed by the inflexed sides or margins of the lobes, it is represented by a very narrow space between the two large keels on the inner face, which (in this species) take the place of the inflexed sides, and at the top on the dorsal part are connected by a narrow arching roof. The flowers appear to have been orange-yellow.

874. **Marsdenia rostrifera**, *N. E. Brown* [Asclepiadaceae]; similis *M. efulensi*, N. E. Br., sed floribus multo majoribus fusco-sanguineis facile distinguitur.

Caulis volubilis, glaber. *Folia* patentia, glabra; petiolus 2–3 cm. longus; lamina 5–9 cm. longa, 2·5–4·5 cm. lata, oblonga vel ovato-oblonga, cuspidato-acuminata, basi late rotundata vel subcordata. *Umbellae* axillares, breviter pedunculatae vel sessiles,

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multiflorae. *Pedicelli* 1–1·5 cm. longi, graciles, unilateraliter puberuli. *Sepala* 2·5 mm. longa, ovata, obtusa, minutissime puberula et ciliolata. *Corolla* rotata, 1·3 cm. diam., carnosa, extra minutissime puberula, intra minute velutino-puberula, fusco-sanguinea; lobi 5–6 mm. longi, 3–5 mm. lati, oblongi, obtusi. *Coronae* lobi fere 1 mm. longi, ex toto antheris adnati, oblongi, obtusi. *Antherae* appendiculae erectae, late ovatae vel rotundatae, obtusae, apiculatae. *Stylus* longe rostratus, ultra antheras ad 3 mm. exsertus, apice acute bifidus.

GOLD COAST. Aburi, in Rubber and Cola plantations, *Johnson*, 1078.

Mr. Johnson states that the flowers are "dark crimson-maroon, thick, fleshy, and smell like native 'stink-fish.'" The leaves appear to have had a shining surface.

875. **Brillantaisia Mahoni**, *C. B. Clarke* [Acanthaceae-Ruellieae]; ex affinitate *B. nitentis*, Lindau, sed foliis floralibus persistentibus basi cuneatis, sepalis 14 mm. longis, nempe 4 usque ad apicem linearibus, 1 lineari in parte superiore paullo latiore vix linear-i-spathulato.

Planta pilosa, glanduloso-viscosa. *Folii* lamina 16 cm. longa, 10 cm. lata, ovato-triangulari-elongata, basi subhorizontaliter truncata, in margine arcte acute serrata; petioli usque ad 4–6 cm. longi. *Inflorescentia* 16 cm. longa, 6 cm. lata, pauciflora, *i.e.* panicula depauperata; folia floralia usque ad 4 cm. longa, 2 cm. lata, utrinque angustata. *Corolla* subcaerulea: tubus 1 cm. longus; labia 25 mm. longa.

UGANDA. Entebbe, in shady spots by water, alt. 1170 m., *Mahon.*

This species is very near *B. nitens*, Lindau, a Kamerun plant in which the floral leaves seen are truncate or subcordate at the base.

Crossandrella, *C. B. Clarke*, gen. nov. [Acanthaceae-Justicieae]; ex affinitate *Crossandrae*, a qua calyce quadripartito et inflorescentia recedit.

Calyx usque ad basin 4-partitus; segmentum posticum ovatum, emarginatum, anticum ellipticum, integrum, 2 interiora breviora, linearia. *Corolla* parva; tubus oblongus; limbus 5-lobus, unilateralis. *Stamina* 4, subsessilia; filamenta brevia, glabra; antherae 1-loculares, loculis lineari-oblongis. *Pollen* linear-i-oblongum, in medio obscure constrictum, in apice utroque quadratum, longitudinaliter costatum; pori 2.—Frutex. Folia *integra*. Spicae *terminales* 10-*florae*; *flores solitarii*; *bractea parva*, *lanceolata*; *prophylla* 2, *majora*, *elliptica*.

This genus is close to Crossandra, the stamens and pollen being the same. It differs in the 4-partite calyx, and the inflorescence which is nearer that of Sclerochiton.

876. **C. laxispicata**, *C. B. Clarke*, sp. unica. *Folia* 14 cm. longa, 4 cm. lata; oblonga, utrinque attenuata. *Spicae* 5–7 cm. longae, minute scabro-pubescentes. *Bractea* 4 mm. longa; prophylla 9 mm. longa. *Calycis* 2 segmenta exteriora 9 mm. longa, interiora

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6 mm. longa. *Corolla* 10–12 mm. longa, alba (fide E. Brown) limbo unilaterali e calyce breviter exserto. *Pollen* 60 μ longum. 20–25 μ latum.

UGANDA. Mawokota, alt. 1170 m., *E. Brown*, 210.

877. **Eranthemum bilabiale**, *C. B. Clarke* [Acanthaceae-Justicieae]; species distinctissima foliis 24 cm. longis lanceolato-obovatis subito breviter acuminatis, panicula 3–4 dm. longa lineari composita densiuscula, corollae tubo 25 mm. longo 1·5 mm. lato usque ad apicem lineari curvato, limbo subplano 15 mm. diametro conspicue bilabiali.

Planta majuscula, fere glabra, inflorescentia triramosa, quasi nudata. *Folia* 24 cm. longa, in margine undulata, omnino *Eranthemi*; petioli superiores 15 mm. longi. *Flores* in ramis abbreviatis paniculae fasciculati. *Calycis* dentes 4 mm. longi, lineares, fere setacei. *Corollae* tubus apice vix dilatatus. Stamina 2; filamenta e tubi ore breviter exserta; antherae loculi 2, paralleli, altitudine aequales, contigui, ecaudati. *Pollen* parvum, subglobosum, vix ellipsoideum, longitudinaliter 3-vittatum. *Capsula* 35 mm. longa, clavata, apice 6 mm lata, 4-sperma, stipite lineari 16 mm. longo. *Semina* complanata, glabra, verrucoso-tuberculata.

UGANDA Mawakota, alt. 1170 m., *E. Brown*, 209.

The corolla, in this complete specimen, is so strongly bilabiate that it has been proposed by a competent botanist to place this species in some remote section of Acanthaceae. The inflorescence, the stamens and the capsule are so typically of Eranthemum that I put it in Eranthemum. This I have no doubt is the true affinity, but some person may prefer to call it a genus novum.

878. **Pteris (Eupteris) intricata**, *C. H. Wright* [Filices-Polypodiaceae]; *P. brevisorae*, Baker, proxima, frondibus ramosioribus spinosis pinnulisque latioribus recedit.

Stipes castaneus, spinosus. *Frondes* deltoideae, 90 cm. longae, basi 60 cm. latae, bipinnatae, obscure virides, glabrae; rhachis castanea, basi 5 mm. diam., versus apicem attenuata debilisque, glabra, nitida, spinis distantibus rectis 3 mm. longis instructa. *Pinnae* infimae 50 cm. longae, basi 30 cm. latae, pinnatae; pinnae reliquae versus apicem gradatim minores; lobi 10–25 mm. longi, 5–7 mm. lati, oblongi, obtusi, minute serrati, lobo infimo quam ceteris multo majore; costa venaeque subtus spinosae. *Sori* 3–8 mm. longi, parte basali loborum positi.

UGANDA PROTECTORATE. Mawakota, 1190 m., *E. Brown*, 158.

879. **Polypodium (Euphegopteris) Thomassetii**, *C. H. Wright* [Filices-Polypodiaceae]; *P. drepano*, Hook., affine, frondibus rigidioribus esquamosis differt.

Stipes 25 cm. altus, supra canaliculatus, subtus convexus, basi squamis pallide brunneis lanceolatis instructus, alibi nudus. *Frondes* deltoideae, 40 cm. longae, 24 cm. latae, pinnatae, coriaceae, glaberrimae; rhachis straminea, supra anguste alata. *Pinnae* fere ad rhachin incisae, lanceolatae, acuminatae; segmenta oblongo-lanceolata, obtusa, crenulato-serrata, margine basali superiore costae parallelo, inferiore obliquo; venae furcatae. *Sori* uniseriales, ad nervorum medium positi.

SEYCHELLES ISLANDS. Mahé, *Thomasset*, 93.

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880. **Polypodium (Goniophlebium) prionodes,** *C. H. Wright* [Filices-Polypodiaceae]; ex affinitate *P. subauriculati*, Bl., a quo pinnis basi acutis differt.

Rhizoma breviter repens. *Stipites* caespitosi, circa 20 cm. alti, 3 mm. diam., plano-convexi, glabri, basi squamis deciduis brevibus ovatis instructi. *Frondes* simpliciter pinnatae, 30 cm. longae, glabrae; rhachis gracilis. *Pinnae* anguste lanceolatae, acuminatae, basi acutae, argute serratae, 12 cm. longae, ad 1 cm. latae, nervo crasso marginali circumdatae. *Sori* parvi, irregulariter 2–3-seriati.

UGANDA PROTECTORATE. West Ankole Forest, 1530 m., on rocks in streams, *Dawe*, 369.

XLII.—THE USE OF SEEDS FOR ORNAMENTAL PURPOSES.

(WITH PLATE.)

The use of ornamental seeds in the manufacture of household articles and for personal adornment is common in many countries, but in few perhaps has the application of natural forest seeds become an industry so definite as appears to be the case in Mazagon, Bombay. This is described in an article which appeared in the "Times of India" for July 13th, 1906, here reproduced.

This article is of interest to Kew as some time ago (May, 1905) Mr. G. M. Ryan, F.L.S., of the Indian Forest Service, presented to the Museum, on behalf of the Sisters of All Saints' School at Mazagon, a handsome screen, measuring 7 ft. by 5 ft., made up of 110 strings in the manner described.

The seeds employed in this instance were "Job's Tears" (*Coix Lachryma-jobi*, Linn.), "Red Wood," sometimes, according to Dict. Econ. Prod. India, called "Red Sandal Wood" (*Adenanthera pavonina*, Linn.), seeds of *Mimusops Kauki*, Linn., and short pieces of what appear to be the peduncles of "Great Millet" (*Andropogon Sorghum*, Brot., var. *vulgaris*, Hack.), or an allied form.

The photograph of which a reproduction is given here, illustrating the work in course of progress, was presented by Mr. Ryan with the screen.

"The Indian jungles are remarkable for the number of hard bright seeds of many colours that are found upon their trees and climbing plants. Every colour except probably light blue and bright green is represented, and these seeds, if gathered when quite ripe, are hard and durable, some being about the hardness of bone. In size they vary from that of a large watch downwards, and beyond occasional use for their real or supposed medicinal properties, they have been allowed to fall and rot where they grow unless, like the myrabolan and mhowra, they possess some commercial value for industrial or economic purposes. The beauty of many of these seeds and their durability must have often suggested their use as ornaments, as it did to Sir George Watt, Director of Economic Products to the Government of India, but the difficulty of piercing them regularly and cheaply seems to have stood in the way until

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Mr. J. Wallace, Editor of the "Indian Textile Journal" at Bombay, took the matter in hand. He had been keenly interested in Oriental industries for more than twenty years, and the utilization of forest seeds seemed to him to offer the nucleus for a minor industry that might take the place of needlework in certain schools, as sewing is one of the worst paid occupations in the world. The drilling of the seeds was the first problem to be solved, and as they varied greatly in shape, appliances had to be devised that would hold them and at the same time guide the drill so that it might always pierce them in the desired manner. All the appliances had to be cheap, easily made, and repaired, and simple enough to be used by unskilled labour without undue wear. The seeds were finally held in an instrument resembling a nut-cracker with conical recesses on the inner sides which held the seeds and a hole passing through the apex of the cone, which guided the drill. These "clamps" were made of hard Indian wood in various sizes, and were arranged for drilling single or double holes through the edge, or side, or for drilling long seeds lengthways with speed and accuracy. The steel of knitting needles, piano wire, and old bicycle spokes were found to be of excellent quality for drills, and they furnished a cheap supply of material which is easily converted.

"When the tools had been reduced to practical form the work was taken in hand by the Sisters of All Saints at their school in Mazagon, Bombay, with a capital of sixty rupees and an outfit of tools presented by their friend the Editor, who became chief artificer and inspector to the new industry. Seeds were contributed in small parcels by friends, and the artistic taste of the Sisters soon produced many charming devices, including certain loops for heavy and light curtains, necklaces, napkin-rings, hat-pins, buttons, bracelets, seed partieres and screens which found a ready sale at remunerative prices. Certain of the seeds, notably the rudraksha (*Elaeocarpus Ganitrus*, Roxb.), sacred to Shiva, were bleached and dyed in brilliant colours which added greatly to their value as buttons, beads, or hat-pins. This process taxed the talent of nearly every well-known chemist in India, who generously gave their assistance free. The rudraksha is a hard spherical nut with a very rugged surface divided normally by fine slits like the divisions of an orange, but it has many varieties both in shape, size, and number of slits, and to each of these varieties special virtues are ascribed. They protect the wearer against sickness and misfortune, procure success in life, and realise all the ambitions of the Hindu. Their value of course varies with the properties ascribed to them, and they are largely sold to pilgrims who visit Benares. When found they are generally very dirty, the interstices being filled with remnants of decayed fruit which adhere strongly, but after the various processes of cleansing, bleaching, dyeing, polishing, and mounting, a remarkable transformation has taken place with a proportionate increase in value. Many of the seeds only require polishing by friction, which brings out a lustre that was previously quite unexpected.

"The first outfit of tools was soon too small and additional drills were needed. The typical machine now consists of six

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small horizontal drill heads arranged along a narrow table which accommodates six drillers. The clamp holding the seeds rests upon a small adjustable bracket which supports it at the level of the drill point; and power is applied by a coolie who turns a wooden wheel at the end of the table. A cord from this wheel makes a single turn around the small pulley of each drill and returns above them to the wheel. One labourer thus serves six drills without any complication of mechanism. The drill heads will, when required, carry wheels for grinding the drills. They will also carry a hook for laying up the silk cords used in embroidery and for making the woollen girdles worn by the Sisterhood. The demand for seeds soon outran the irregular contributions of friends and acquaintances, but fortunately arrangements were soon made for a system of supply direct from the jungles. Space for a display of the work of the All Saints Sisters in the Forest Section of the recent Industrial and Agricultural Exhibition was also provided, where the industry gained a bronze medal and attracted much attention, their 'chicks' or partiers being conspicuous for their rich and harmonious colouring. Beads of special kinds have been introduced among the seeds with excellent effect, and although the number of seeds used is over 25, the list is far from complete and is constantly being added to. The resources of Burma, Ceylon, and many parts of India are still unexploited.

"The seed and bead industry is interesting for several reasons. It is based on the use of materials which were previously without value, and these materials are worked up with the aid of new tools and appliances designed expressly for them under very strict limitations as to cost and complication. The industry has become a commercial success in the hands of ladies who had no previous experience in the work, which seems to be especially adapted to the needs of industrial schools as without being very difficult to learn, it requires enough of special knowledge to protect it against the competition of careless or unscrupulous rivals whose one object is cheapness, regardless of quality. At All Saints' Home quality of work and speed of production receive due attention, and as these essentials demand that all the tools and appliances shall be kept in good order, the training of the workers is of a kind that is but calculated to correct the national habit of carelessness among them.

"Seed and bead work should take a prominent place among the small industries of India, and should serve as a model for kindred undertakings in which simple appliances are needed to increase the efficiency and productiveness of the workers. Her Royal Highness the Princess of Wales when in Bombay recently paid a visit to the Industry and made several purchases. One of her purchases was a necklace which is now named after her."

XLIII.—FUNGI EXOTICI: V.

The nine new fungi here described from material in the Herbarium at Kew include three Malayan species communicated by Mr. H. N. Ridley, Director, Botanic Gardens, Singapore; three West African species sent by Mr. W. H. Johnson, lately Director of

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Agriculture, Gold Coast; two West Indian species collected by Mr. J. H. Hart, Superintendent, Botanic Department, Trinidad, and a Polynesian species obtained by Mr. D. Yeoward, Curator, Botanic Station, Fiji.

POLYPORACEAE.

Polystictus Ridleyi, *Massee*. *Pilei* plures basi confluentes, infundibuliformes, radiatim striatuli, concentrice plurizonati, tenuissimi, coriaceo-lenti, flexiles, pallide incarnato-grisei, 5–8 cm. diam. *Hymenium* planum e poris brevissimis, ore rotundato, 300 μ diam., dissepimentis tenuis albo-flavescentibus compositum. Basidia et sporae non visa.

MALACCA. Ayer Kerok; on dead wood, *Ridley*, 149.

A very beautiful fungus remarkable for the exceedingly thin, pliant flesh. The pileus is very pale flesh-colour with a tinge of grey or lavender; the numerous narrow concentric zones are sometimes darker in tint than the remainder. Belongs to the *Perennes* group of *Polystictus*, but does not approach at all any described species.

THELEPHORACEAE.

Craterellus verrucosus, *Massee*. *Pileus* membranaceus, infundibuliformis, deorsum in basi stipitiformi productus, fuligineus, dense verrucosus, 3–4 cm. latus, 5–7 cm. altus. *Hymenium* inferum venoso-corrugatum, lividum. *Sporae* subglobosae, hyalinae, glabrae, 8 × 6–7 μ.

PENANG. Near Penang Hill; on the ground, *Ridley*, 163.

Gregarious; with the general aspect and habit of *C. cornucopioides*, Pers., from which it differs in its smaller size, distinctly warted pileus, and smaller subglobose spores.

HYDNACEAE.

Hydnum lateritium, *Massee*. *Pileus* tenuis, subinfundibuliformis, sericeus, azonus, lateritius, 1–2 cm. latus. *Aculei* sparsi, acutiusculi, apice quandoque subincisi e lateritio-fusci expallentes. *Stipes* pileo concolor, glaberrimus 1 cm. longus. *Sporae* subglobosae, hyalinae, glabrae, 3·5–4 μ diam.

GOLD COAST. Aburi; among humus, *Johnson*, 107.

Entirely pale brick-red, or with the pileus sometimes darker in colour. Allied to *H. tomentosum*, Fries.

XYLARIACEAE.

Xylaria fibula, *Massee*. *Stromata* sessilia, pulvinata, subtus umbilicata, extus fusco-atra, opaca, minutissime granulata, intus albo-farcta, suberosa, 1–1·5 cm. lata. *Perithecia* majuscula, globosa, vix papillato-ostiolata; asci cylindracei apice obtuse rotundati, basi elongato-pedicellati, paraphysibus filiformibus obvallatis, octosporis. *Sporae* oblique monostichae, ellipsoideae, inaequilaterales, 26–30 × 8–10 μ, primo 2-guttulatae dein opace fuligineae.

SINGAPORE. Bukit Timah; on dead wood, *Ridley*, 159.

A very distinct and remarkable species; the stroma is quite sessile, convex above, umbilicate below, hence presenting a

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concavo-convex outline in section. Attached by a small point in the centre of the umbilicus. Allied to *X. tuberiformis*, Berk.

NECTRIACEAE.

Calonectria gigaspora, *Massee*. *Perithecia* aggregata, obovata, laevia, glabra, coccinea, 1 mm. alta. *Asci* longissimi, ectospori, aparaphysati. *Sporae* oblique monostichae vel supra subdistichae, hyalinae, subfusoideae, demum 3-septatae, 90–100 × 20 μ.

WEST INDIES. Trinidad; in channel made by the "borer" in sugar-cane, *Hart*.

Readily recognised by the peculiar form of the perithecia, and the very large spores.

DERMATEACEAE.

Tryblidiella tetraspora, *Massee*. *Perithecia* erumpentia, alte exserta, elliptica seu subtrigona, 2–4 mm. lata; labris, tumidulis atris, striatulis intus involutis; disco plano, rufo-fulvescente. *Asci* cylindracei, apice rotundati, tetraspori, basi attenuato-stipitati, 250 × 20 μ, paraphysibus densissimis longioribus, vertice fusco-fuligineis obvallati. *Sporae* monostichae, oblongo-ellipticae; utrinque rotundatae, triseptatae, ad septa non vel vix constrictae, brunneae dein atro-fuligineae opacae, 50 × 15 μ.

GOLD COAST. Aburi; on dead branches, *Johnson*, 119.

Readily distinguished by the tetrasporous asci and the large size of the ascophore.

MELANCONIACEAE.

Stilbospora Cacao, *Massee*. *Stroma* subcutaneo-erumpens, corticolum, sparsum, conico-truncatum, nigrum. *Conidia* subcylindracea, olivacea, 1- demum 3-septata, ad septum subconstricta, 19–24 × 7–9 μ. *Basidia* simplica, hyalina, obverse clavulata, 40–50 × 1·5–2 μ,

TRINIDAD. On branches of *Theobroma Cacao*, L., *Hart*.

Allied to *S. brevis*, Berk. and Rav., a species occurring on branches of *Carpinus* in S. Carolina; differing in the much smaller conidia and the scattered habit.

Colletotrichum echinatum, *Massee*. *Maculae* indeterminatae, pallescentes. *Acervuli* laxe gregarii lenticulares, mox erumpentes, 350–400 μ diam. *Conidia* hyalina vel chlorina, cylindracea, utrinque obtusa, 22–26 × 8–9 μ, sterigmatibus cylindraceis sursum subattenuatis pallide griseis 40–50 × 8 μ suffulta; ciliis numerosissimis, rigidulis, fuligineis, cylindraceo-attenuatis, septatis, 100–120 × 8 μ.

GOLD COAST. Aburi; on dead bark of unknown plant, *Johnson*, 131.

Distinguished from allied species by the coloured conidiophores and stroma, and by the numerous cilia.

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Aposphaeria Canavaliae, *Massee*. *Maculae* arescenti-nigricantes, irregulares, indeterminatae. *Perithecia* superficialia, atra, glabra, ostiolo conico pertusa, contexto parenchymatico brunneo donata. *Sporulae* magnae, hyalinae, utrinque obtuse rotundatae, 24–30 × 8–10 μ, sterigmatibus cylindraceis 12–15 × 4 μ hyalinis insidentes.

FIJI. On dead pods of some species of *Canavalia*, *Yeoward*, 9.

Forming blackish patches of large size on the surface of the pod. Allied to *A. macrospora*, Sacc., differing in the somewhat smaller spores and the much longer beak or ostiolum of the perithecium.

XLIV.—TREES AND SHRUBS IN SCOTTISH GARDENS.

Ever since the middle decades of the last century—the days of the famous Oregon Association and of the collectors W. Lobb and Jeffrey—the gardens of Scotland, and more especially those of Perthshire, have been noted for their collections of conifers. Certain types of coniferous plants, especially those of West American origin, seem to find there conditions more congenial to them than almost any other part of the British Isles or even of Europe affords. No single garden or locality, I believe, will ever be found to suit all conifers. Irrespective of hardiness, their requirements are too varied for that. But a climate with no great extremes of heat or cold, with abundant moisture, and never subject to the long intense droughts such as are common in the Thames Valley, induces the luxuriant growth of a larger proportion of Firs and Spruces than any other. Such a climate a considerable portion of Scotland affords.

It is not only conifers, however, that find such congenial conditions there. The extensive seaboard of the country, the deep inlets of a sea warmed by the Gulf Stream and the large extent of mountain, all tend to make the valleys and plains of the western side of Scotland peculiarly adapted for a vegetation which prefers moisture and an equable temperature rather than heat and sunlight. The plants of Chili, of New Zealand, of certain parts of Japan and the Himalaya and of the upland valleys of Northern California are of this type. We consequently find, what may at first seem a curious anomaly, that many plants are thriving in Ross-shire which would not survive the winter in some of the wine-growing districts of France.

A visit, therefore, to a representative group of gardens in Scotland promised to be full of interest and instruction. With the aid of the Director and others acquainted with Scottish gardens, a list of fifteen private places was made and these I visited during the month of July last.

I also visited the two chief botanic gardens of Scotland—those of Edinburgh and Glasgow. The foundations of an interesting and representative arboretum are being laid in Edinburgh by Prof. Bayley Balfour, but the exposed position and the climatic conditions are, I believe, adverse to luxuriant tree-growth. A large

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proportion, at any rate, of the trees are as yet in a comparatively juvenile state. The collection of rare shrubs, however, is of great richness, especially those belonging to the Heath family and such genera as *Erica*, *Bryanthus*, *Enkianthus* and *Rhododendron*. The great rock garden, which is being further enlarged, is, more than ever, a feature of peculiar interest.

In Glasgow the atmospheric conditions in the Botanic Gardens and inner parks could scarcely be worse. Conifers can hardly be grown at all and even such a tree as the Horse Chestnut is so strangely stunted as to be scarcely recognisable. The Glasgow Corporation, fortunately, under the guidance of Mr. Whitton, pursues a vigorous and enlightened policy in relation to its parks and gardens, and the number of these open spaces in the outer ring has greatly increased in recent years. The conditions here are more favourable, and the indoor gardening in some of these newer parks is particularly good, especially as regards Orchids and greenhouse plants. I do not, however, propose to discuss the gardens either at Glasgow or Edinburgh. My object is rather to draw up a few notes on the country places I visited where the cultivation of trees and shrubs is not hampered by adverse conditions. And there I did, indeed, find certain classes of trees, sometimes restricted, perhaps, in the number of species, but represented by such a number of individuals and in such magnificent size and vigour as probably no other part of the British Isles can show.

Murthly Castle.

To conifer-lovers in the British Islands Murthly has for many years been a place of extraordinary interest, and it is likely, I think, to long remain their Mecca. Remarkable as Scotland is for its conifers, in no other place, so far as I have seen or heard, do they exist in quite such magnificent profusion combined with such size, health and vigour. The grounds are situated about 2½ miles out of Dunkeld on the beautiful slopes of Tayside, and contain about six miles of grass walks and avenues mostly bordered with splendid conifers. There is a very extensive collection of species and varieties but the dominating tree of Murthly is the Douglas Fir. There are numerous specimens ranging from 80 to over 100 feet high some of them with trunks more than 10 feet in girth. They are of many shades of colour ranging from the glaucous green of the Colorado type to the ordinary soft, more grass-like greens. Where they have been planted sufficiently near together to simulate forest conditions they have made magnificent straight, clean trunks of timber. A high opinion is held at Murthly of the durability and value of this timber. I was informed by Mr. Laurie, the gardener, that a gatepost, now in use for 15 years, was still in good condition. Planted singly, with room for lateral development, the fine contour and immense plume-like branches render this tree one of the most ornamental of all conifers.

Next to the Douglas Firs the most noteworthy of the bigger trees are *Tsuga mertensiana* (the *Abies albertiana* of Scottish gardens), *Abies grandis*, *A. nobilis* and *Picea sitchenis*. *Tsuga mertensiana*, one of which I made out to be 85 feet high, with its

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tall, tapering, well-formed trunk, is one of the most beautiful of conifers and presents a remarkable difference in habit from its East American ally—*T. canadensis*—of which there is also a fine example 59 feet high but with a big, rounded, bushy head and a short trunk 8 feet 6 inches in girth. *Abies grandis*, one specimen of which girths 8 feet, grows very quickly here; trees about 20 years old are now 54 feet high. *Abies nobilis*, planted in great numbers, is one of the features of Murthly; the intense glaucous hue of its younger branches and the great crops of cones—large, stiffly upright and purple—which some trees bear near the top, make it one of the most conspicuous. One specimen I measured was 80 feet high and 7 feet 10 inches in girth. Of *Picea sitchensis* (known often as *Abies Menziesii*) one was 12 feet in girth and, approximately, 100 feet high.

Pinus monticola, of which so high an opinion used to be held at Murthly, and of which numerous excellent specimens used to grow there, has, in many cases, had to be destroyed on account of the attacks of a destructive pine-rust (*Peridermium* sp.). There is one specimen, however, which, although not quite so fine as the tree at Scone, must still be one of the finest in the country; it is 91 feet high and 6 feet 7 inches in girth.

The glaucous form of *Tsuga pattoniana*, generally known in gardens as *T. hookeriana*, is at Murthly the most beautiful of the purely ornamental conifers. Till one sees it as it is here one can form no adequate idea of its merit. There is one specimen, a pendulous variety, which is the most beautiful conifer I have seen. It is 54 feet high, the trunk just over 4 feet in girth, and its dense, gracefully pendent, plumose branches are of a silvery glaucous hue. In the sunlight, and in contrast with darker-leaved things around, it made a singularly attractive picture. It was interesting to note that seedlings raised from this pendulous variety have turned out to be true *T. hookeriana*; they have not inherited the pendulous character of the parent tree, nor have they reverted in the least towards *T. pattoniana*, of which species, as I have already intimated, *T. hookeriana* is considered to be merely a glaucous variety. A fine tree of the ordinary *T. hookeriana* has a trunk 6 feet 2 inches in girth.

Sequoia gigantea, planted in 1857, is now about 90 feet high and 12 feet 2 inches in girth. *Picea ajanensis*, the most beautiful of Japanese conifers, was 33 feet high, and *P. orientalis* 60 feet high. *Abies Veitchii*, disappointing at present as an ornamental tree on account of its thin habit, was 31 feet high.

Among rarer things were *Juniperus recurva*, the striking Himalayan species, 30 feet high and very well furnished; *Cryptomeria japonica* var. *spiralis*, not remarkable for size but showing the spiral arrangement of the branches particularly well; *Abies sachalinensis*, a very uncommon species, 16 feet high, but here, as elsewhere, not quite satisfactory; *Picea Omorica*, the Servian Spruce, and one of the most promising of recent introductions, bearing cones—the first I have heard of in Britain. There was also a healthy young plant of *Pinus pentaphylla*, 4½ feet high; this species is a native of Japan and allied to *P. parviflora*, and the Murthly specimen is one of very few in the country. In a nursery bed was a healthy batch of about 600 seedlings of *Larix*

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occidentalis. Some interest is being taken just now in this Larch, a native of Western North America, as a possible substitute for the common Larch. The species is uncommon, and the best trees in the country are probably those in the pinetum at Kew; they are 25 to 30 feet high and bear cones most seasons.

Murthly has some notable Yews. Some of them are between 400 and 500 years old, and have now huge spreading heads. One has a trunk 10 feet 10 inches in circumference at three feet from the ground. There is also a huge specimen of the Sweet Chestnut rivalling in bulk the enormous trees at Studley Royal, in Yorkshire. At five feet from the ground the trunk measures 24 feet in circumference, and near the ground it is 32 feet; it has, moreover, the remarkable spiral arrangement of the trunk fissures that is occasionally seen in this tree. A specimen at Kew has this character very well marked.

Scone Palace.

The long and intimate connection of Scone with the history of Scotland and of the Scottish kings imparts a charm to the place which ancient associations always give. This charm, however, is not always felt so keenly as it is at Scone where thick woods, fine old trees, and spacious lawns are admirably in consort with its romantic history. One of the striking things about Scone, indeed, is the rich and varied character of the woods surrounding the Palace. Mixed with the ordinary deciduous trees of the country, of which there are magnificent old specimens, are numerous fine examples of Douglas Fir, Silver Fir, and other conifers which give a warm and luxuriant effect. Besides this there is, to horticulturists, the additional although minor interest of its being associated with the early years of David Douglas—one of the first and most famous of plant-collectors. He was born at the village of Scone in 1799 and received his first training as a gardener in the Palace gardens. A notable tree in the grounds is a specimen of Douglas Fir which was one of the original trees introduced by him in 1827 and planted on its present site in 1834. It is now 10 feet 2 inches in girth and only one or two feet short of 100 feet high.

The collection of conifers is grown on a piece of ground specially set apart for them. They are planted on well-kept lawns in straight lines with abundant space for the development of each. The health of the trees is excellent and the general effect imposing and not ill-suited to the formal character of the trees. Perhaps the most notable tree in regard to size in the pinetum at Scone is *Pinus monticola*. This tree in 1891 was 71 feet high; I made it to be now 93 feet high, so that in 15 years it has grown 22 feet; its girth at 4 feet was 7 feet 11 inches. I imagine this to be the finest specimen in Britain. Other fine Pines are *P. ponderosa*, 70 feet high and 7 feet 11 inches girth, and *P. Cembra*, 51 feet high. Of the Silver Firs *Abies nordmanniana* was 66 feet high and 5 feet 11 inches girth; *A. Pinsapo*, 51 feet high; *A. lowiana*, 54 feet high. There was also a beautifully coloured *A. concolor* var. *violacea*, 27 feet high. Of more than ordinary interest to me was a small but healthy young tree of *Abies Mariesii*; this species is exceedingly rare and the specimen at Scone was the only one I

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saw in Scotland. The Irish Juniper (*Juniperus communis* var. *fastigiata*) made a column 20 feet high, and a specimen of the common Savin was 10 feet high and covered a space 30 feet in diameter.

Near the Palace are some immense specimens of common trees. A Sycamore (*Acer Pseudoplatanus*) said to have been planted by Mary, Queen of Scots, is still alive but somewhat of a wreck; its trunk, roughly, is about 6 feet in diameter. A gigantic *Populus deltoidea*, the North American "Cottonwood," is 15 feet in girth of trunk.

Kinfauns Castle.

The castle of Kinfauns, built on a historic site, occupies a delightful position a few miles out of Perth. It is somewhat elevated above the valley of the River Tay and behind it rises a magnificent amphitheatre of hills. The gardening here, both indoor and outdoor, is very good, the greenhouses containing for their size a better collection of well-grown plants than I saw elsewhere. The garden is a delightful spot, especially above the house, where it occupies a valley with sloping lawns running down to a brook in the middle and dotted with fine old trees. Conifers are well grown and vigorous, but not many are exceptional in size as these trees go in Perthshire. *Pyrus rotundifolia*, one of the White Beam trees native of Britain but now rare in a wild state, I found here 60 feet high, its trunk 7 feet in circumference. *Quercus Turneri* was 45 feet high—loftier than I have noticed elsewhere, and a specimen of the variegated common Oak was exceptionally well coloured. A fine Sycamore over 100 feet high and a Canadian Hemlock Spruce are also features of the place.

Leny.

Situated about one mile from Callander, and not far from the Trossachs, Leny occupies a position of great natural beauty. To botanists it is a place of more than ordinary interest in being the home of one of the fathers of Indian botany—Francis Buchanan Hamilton (1762–1829). He lived at Leny after he retired from the superintendentship of the Botanic Gardens at Calcutta in 1816, and died there thirteen years later. Some of the present walks about the grounds were planned and made by him. Leny now belongs to his grandson, Mr. Hamilton Buchanan, chief of the clan Buchanan.

The principal feature of the grounds at Leny is the "glen." This is a picturesque gorge worn out of the face of a steep hill behind the house, down which a burn pursues a rugged and tortuous course. The sides of the glen are in places so precipitous as to necessitate the crossing and recrossing of the stream several times. Along its banks have been planted numerous beautiful trees and shrubs now in luxuriant growth. Perhaps the most noteworthy of these are two Himalayan Rhododendrons—*R. barbatum* and *R. Thomsoni*—both of which are now 25 feet high. From their immense size, it is not improbable that they were raised at Leny from seeds sent to Francis Hamilton about 1819 by Wallich, his successor at the Calcutta

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Botanic Garden. If so, they must be the oldest in the kingdom. Among other things of interest are fine specimens of Canadian Hemlock Spruce—*Tsuga canadensis*—one of which has a trunk 7 feet 2 inches in girth. Another good specimen is growing most picturesquely on the edge of the gorge, whose precipitous side it overhangs, evidence of how much the climate favours the growth of such trees, for its roots appear to be embedded mainly in the rock. *Tsuga mertensiana*, the common Silver Fir and Douglas Fir, are represented by fine healthy specimens, although not so large as one sees in other parts of Perthshire. Here also is growing what I think is the finest specimen I have seen of the cut-leaved Beech—*Fagus sylvatica* var. *heterophylla*. It has a trunk just over 7 feet in girth and it is 70 feet high.

Dunkeld.

No true arboriculturist would pass Dunkeld for the first time without making a pilgrimage to the two famous so-called "parent" Larches standing near the old cathedral. They are the survivors of five trees planted there in 1738 by the then Duke of Atholl. It is a matter for regret that one of them is now dying, having, it is believed, been struck by lightning. The dimensions of the other are given on a tablet at its base :—Height, 102 feet ; girth at 3 feet, 17 feet 2 inches ; girth at 68 feet, 6 feet 1 inch. Near the house are several other magnificent Larches, scarcely, if at all, inferior to this—one in particular was noticeable for its enormous bulb-like base, 8 feet in diameter.

Dunkeld is the original home of the Larch in Britain in more senses than one. It was here that the first plantations on a large scale were made, and the names of successive Dukes of Atholl in the 18th century will always be remembered as the pioneers of this branch of forestry. According to Hunter, in his "Woods, Forests, and Estates of Perthshire," plantations of 27 millions of Larches were made by the fourth Duke alone—still known as "The Planter."

As is well known, Dunkeld is situated in a district of singular natural beauty, and the grounds are amongst the loveliest in Scotland. Lofty precipitous hills rise around them, and a charming grassy walk, broad and closely mown, winds by the side of the rushing Tay. The collection of conifers is being added to, but the number of species represented by unusual specimens is not great. The common Silver Fir, however, is in magnificent condition, one of them is estimated to be between 140 and 150 feet high. At Kew this tree can only be kept alive for a few years. There is also a fine *Thuya dolabrata*, 20 feet high, and not showing its usual disposition to become thin and lanky at the top. Of numerous well-grown hardy shrubs I noted *Kalmia latifolia*, 9 feet high and 12 feet through, finely in flower, and *Viburnum prunifolium*, 20 feet high.

Blair Castle.

This is another of the seats of the Dukes of Atholl, and, like Dunkeld, is one of the most beautiful places in Scotland. The gardens are picturesque, with fine views and very pretty avenues and drives, and to the west of the castle there is a magnificent

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gorge and a waterfall. An avenue of Silver Birch is so delightful that one wonders this tree is not more often used for minor avenues. The kitchen garden, too, is, I think, the most charmingly situated of any I have seen. It covers the opposite slopes of a valley, the bottom of which is filled by a large piece of water with islands in it. The grounds are furnished with many fine trees, but in size these are not equal to others elsewhere mentioned in these notes. There are several Larches here said to have been planted, like those at Dunkeld, in 1738. A most noteworthy tree is a specimen of the distinct and elegant *Abies magnifica*, 60 feet high, and in perfect health and form. *Abies nordmanniana*, planted by Her Majesty Queen Alexandra in 1872, is 45 feet high; and *A. nobilis*, planted by her six years later, is the same height. Both here and at Dunkeld *Larix leptolepis* is thought to be a promising forest tree. A plantation of this species mixed with a few others is making excellent growth; the trees were planted 17 years ago and some already girth over 2 feet.

Inverewe, Ross-shire.

The house of Inverewe was built by Mr. Osgood H. Mackenzie in 1864 on what was then a bare hillside clothed with nothing bigger than heather and bracken. It is now surrounded at the back and sides by thick woods, 60 feet and more high, and gives an excellent example of what can be done, and what results obtained, in one man's lifetime—and he still in hale middle life. Mr. Mackenzie's garden, although not a large one (it is worked I believe by one or two men), has in recent years acquired a reputation as being one of more than ordinary interest. It is situated within a short distance of Poolewe, on the shores of Loch Ewe, and in the great parish of Gairloch, Ross-shire. It is, consequently, in a latitude 20 to 30 miles farther north than that of Inverness. Yet there are growing here in great luxuriance trees and shrubs from Chili, New Zealand, South Africa, and the Himalaya, which near London have to be grown under glass. The climatic conditions, therefore, must be very similar to what obtain in S.W. Ireland and Cornwall, although no doubt the mean annual temperature is considerably lower.

In approaching the house one is struck by the number of *Eucalypti* sprinkled on the outskirts of the wood. They are mostly *E. coccifera*, and although but 10 years old are now 35 feet high. An interesting experiment might be made in this or some similar part of the country by planting an acre or two of this *Eucalyptus*, *E. Gunnii* and *E. urnigera*, under forest conditions. Nothing, except perhaps Poplar, could be got to grow faster, and the reproduction of an Australian gum-tree forest on even a small scale would be particularly interesting. It is also not improbable that the timber would prove of some value.

Mr. Mackenzie's rarer shrubs are planted in clearings of the plantations near the house. They are consequently well sheltered. Among Himalayan plants a representative lot of Rhododendrons have been planted, but although very healthy they are yet small. *Buddleia Colvillei*, however, the finest of all the Buddleias, was in flower. Since this species flowered for the first time in the

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British Isles with Mr. Gumbleton, near Cork, in 1892, it has done so in several other places in Ireland and England, but Inverewe must be one of the first places where it has flowered in Scotland. It was growing quite in the open.

There is a goodly number of New Zealand and Tasmanian plants here too, and a suggestive indication of the character of the climate is afforded by the way they thrive. Veronicas, for instance, are coming up over the place from naturally sown seed, and *V. salicifolia* is 7 feet high. Rich as Scotland is in her conifers one would scarcely expect to find *Podocarpus Totara*—the "Totara" of New Zealand, and perhaps the most valuable of its timbers—growing out of doors. Yet here it is in perfect health. A plant of *Billardieria longiflora*, 8 feet high, and trained up a tree trunk, was very prettily in flower, but it is even more attractive when followed by the crop of bright violet-blue berries. *Olearia Traversi* and *Leptospermum lanigerum* were both 8 feet high, and *Correa alba*, on a wall, was 6 feet high. *Olearia macrodonta* has, I believe, been very fine this year in Ireland and other mild districts. A fine bush, 14 feet in diameter, and some smaller ones were simply masses of white flowers.

Of Chilian shrubs I noted the following:—*Lomatia ferruginea*, often known as *L. pinnatifolia*, very healthy (I learnt that in another Ross-shire garden it was 10 feet high); *Mutisia decurrens*, the rare climbing composite, in good condition; *Abutilon vitifolium*, 10 feet high, and flowering freely; *Azara Gilliesii*, *Escallonia pterocladon* (very charming here as elsewhere in Scotland), *Cestrum elegans*, *Tricuspidaria*, *Eucryphia cordata*, *Desfontainea spinosa*, and Fuchsias as hedge plants.

Of species from the Cape of Good Hope, *Phygelius capensis*, a bush 7 feet high, and a very healthy *Freylinia cestroides* were the most noteworthy that I saw.

Drummond Castle.

The ancient seat of the Earls of Perth is about three miles out of Crieff, being set on an eminence and approached by a long narrow avenue of Beech and Lime. It is now one of the seats of the Earl of Ancaster, but the present residence is a modern building quite separate from, but close to, old Drummond Castle. This latter building (or, rather, what remains of it) is still in perfect repair, and from its highest tower a glorious view is to be had: mountain in the distance, wooded country and loch nearer, and, close beneath, the unique formal garden of Drummond. This garden, which is of an imposing and elaborate design and admirably kept, was originally planned and carried out in 1703 by a former proprietor and his gardener named Kennedy. The original design has been maintained for over 200 years although additions have been made. The beds and masses are in geometrical form—triangular, circular, &c.—and they are largely filled with shrubs of various sorts kept low and flat, whilst the paths are bordered with a variety of shrubs clipped into narrow, columnar shape. These columnar trees are as good as any of the kind I have seen; they are now 80 years old, in excellent health and perfectly

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furnished. The plants used are Box, Yew, Purple Oak, Fern-leaved Oak, *Thuya occidentalis*, and the golden and silver varieties of Holly. The effect of the whole is impressive, especially when seen from the castle on its abrupt eminence above. This was, no doubt, the point of view of the original designer, for, like all examples of this type of gardening, it is the view as a whole that constitutes its chief *raison d'être*. Seen in detail, its lack of variety, the absence of light and shade, and its general monotony are apt to weary.

But the formal garden, whilst the chief feature at Drummond Castle, is not the only one. The fine yews planted in 1703 are now enormous specimens with trunks 8 to 10 feet in circumference, and both conifers and "hardwoods" grow finely here. Wherever one goes in Perthshire one hears about the great storm of November 17th, 1893. Patriarchal trees that had withstood the gales of centuries succumbed that night and whole plantations were levelled as if the trees had been so many nine-pins. Evidences of this terrible storm are to be seen even now in many parts of the country—uprooted tree stumps, decaying prostrate trunks, and bare hillsides. At Drummond a noble *Abies pectinata* was blown down, but the stump, 3 or 4 feet high, still stands where it grew. It shows that the tree was 210 years old and that its trunk was 6 feet 6 inches in diameter; it contained 1,010 cubic feet of timber. This must have been nearly, if not quite, the largest common Silver Fir in Britain of which there is any record. An enormous Beech near by was seriously injured by the same gale; the trunk of this tree girths 19 feet 5 inches at its narrowest. Many other trees are in good condition here, but are not so notable as those seen elsewhere and mentioned in other parts of these notes.

ABERCAIRNEY.

This place is about 4 miles out of Crieff and is situated in an undulating well-wooded park. The planting of the coniferous trees was done mainly about 40 years ago, and the growth being particularly good some fine specimens are now to be seen. Taking first the Silver Firs: *Abies nordmanniana* is 63 feet high; *A. concolor*, 65 feet high and 5 feet in girth (a big specimen); *A. cephalonica*, 75 feet high; *A. grandis*, 90 feet high and 10 feet in girth; these splendid trees were all in perfect health and shape. A good specimen of *A. pectinata* girthed 15 feet 9 inches. The most interesting Spruce was *Picea orientalis*, 63 feet high. The Tsugas, too, were admirable: *Tsuga mertensiana*, 84 feet high; *T. pattoniana*, 40 feet, and its glaucous variety (*T. hookeriana*) 30 feet high. Of the Pines I was most struck by *Pinus Cembra*, 63 feet high and 5 feet 7 inches in girth. A tree of *Larix leptolepis* was interesting as showing the rate of growth of this tree in Scotland; it was planted 23 years ago and is now 42 feet high. The Irish Juniper (*J. communis* var. *fastigiata*) makes here a rigid column 20 feet high and 3 feet through. These figures show that, although the dimensions of some of these trees are exceeded elsewhere, the general level of excellence is exceptionally high.

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Ochtertyre.

Ochtertyre is situated about 2½ miles out of Crieff in a large, picturesquely hilly park, from which fine views of the surrounding country can be obtained. The garden has long been famous for its conifers, and probably no locality, even in Scotland, is better adapted to the cultivation of a large number of evergreen trees and shrubs. Much of the present attraction that Ochtertyre has for tree-lovers is due to the late Mr. Geo. Croucher, who was gardener there for 45 years under Sir Patrick Keith Murray and his father. He planted most or all of the rarer trees.

A feature of special interest is the number of garden varieties of conifers. Of the Douglas Fir, for instance, there is the finest specimen in the country of the variety *Stairii*; it is 39 feet high, well furnished, and of a pale greenish yellow which is not only distinct, but ornamental. Of the Golden Douglas Fir, a rare variety, there is an admirable tree 40 feet high, and the very glaucous variety is represented by a specimen of the same size in perfect health and colour. The Golden Scots Pine, *Pinus sylvestris* var. *aurea*, is here a big bush 16 feet high and as much in diameter; this variety has the curious habit of assuming its highest colour in winter, turning greener as summer approaches. The glaucous variety of *Picea Engelmannii* is 25 feet high, and the golden variety of *Cupressus pisifera* (commonly known as *Retinispora plumosa aurea*) is 18 feet high, 15 feet in diameter, and in excellent colour.

Turning to the species themselves, *Picea ajanensis* impressed one by its magnificent health and the vivid blue-white colouring of the lower surface of its leaves, which is not surpassed, I think, by that of any other plant in cultivation; one specimen was, approximately, 45 feet high. *Saxegothea conspicua*, a curious conifer with some affinity to the Yew, introduced from Chili in 1847, is now very rarely met with; it is, however, in fine condition at Ochtertyre, a plant being 12 feet high and 8 feet through. The Silver Firs have the usual rude vigour of these trees in Perthshire, a specimen of *Abies cephalonica* being unusually fine. I was unable to take its height, but its trunk was 8 feet in girth. Then *A. magnifica* I saw 70 feet high and finer than elsewhere. This species is much less common than its ally, *A. nobilis*, one of the most frequent of purely ornamental conifers in Scotland. At one time these two species were confused, but seen in the adult stage they are very distinct, *A. magnifica* being denser in habit and much more slender and tapering in form. *Picea Morinda* had a trunk 8 feet 8 inches in girth and was 66 feet high, and of the common Spruce I saw a tree 120 feet high.

It is not only the conifers that thrive so well at Ochtertyre, some of the ordinary evergreens are very good also. A specimen of Portugal Laurel, for instance, was 30 feet high and 50 feet through; *Ilex crenata*, 7 feet high; *Rhododendron dauricum*, 8 feet high; *Pieris floribunda*, splendid bushes, 10 feet through.

Monzie Castle.

This place, which is about three miles out of Crieff, I visited in a persistent downpour of rain. Although it has not much of

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unusual interest to arboriculturists, it is worth visiting for the sake of its three enormous Larches. These are planted together in a row, and are said to be of the same age as the more famous trees at Dunkeld, and to have been planted a few days earlier. The largest of them I made to be 108 feet high and 17 feet 6 inches in girth; it is, therefore, about equal to the greater of the Dunkeld Larches. Of other trees I noted *Populus deltoidea*, 120 feet high, and the common Birch, 84 feet high. New to me as a hedge plant was the Douglas Fir; it answered the purpose, however, very well, being dense and well furnished.

Dalkeith Palace.

The gardens of Dalkeith have long been known as among the leading ones of the United Kingdom. Managed by a succession of famous gardeners, they have constituted a school of horticulture from which many noted men have been sent out. One reason of this is that the place is what may be termed an "all-round" one, where neither the kitchen garden, the flower garden, nor the hothouses absorb more than their due share of the attention of the staff, but all are good. For this reason the trees and shrubs, though they constitute a very interesting collection, do not predominate as they do in other famous places I visited. The climate is considerably drier than that of Perthshire, consequently the growth of many conifers, more especially Firs and Spruces, is not so luxuriant as it is there. Still, I found the Himalayan *Juniperus recurva*, a fine bush 14 feet high and through, and there are three fine old Cedars, one of which girths 13 feet 9 inches. *Ginkgo biloba* is represented by one of the fine specimens of this country, 50 feet high and very healthy, as are *Abies Veitchii*, 20 feet high, and *Picea pungens*, 18 feet high.

Many years ago the varieties of the Scotch Rose (*R. spinosissima*) were very popular in gardens. Most of them are now almost lost to cultivation, and it was, therefore, a pleasant surprise to find a collection here of about ninety varieties got together by a former Duke of Buccleuch in the early part of the nineteenth century and still carefully guarded.

Among the trees, mention should be made of a very fine weeping Ash, 50 feet high; *Ilex dipyrena*, 20 feet high; and a remarkable old specimen of Laburnum, low, and spreading in habit, and covering a piece of ground 60 feet across. To one whose lot is cast in the south one of the notable differences in the ordinary vegetation of Scotland from that of the south of England is the predominance of the Scotch or Wych Elm over the common *Ulmus campestris*. In the south the Wych Elm is comparatively rare. Here at Dalkeith is the noblest specimen I have ever seen; it is 125 feet high, with a clean trunk girthing 13 feet 9 inches at 4 feet from the ground.

Smeaton-Hepburn.

The garden of Sir Archibald Buchan-Hepburn at Smeaton in Haddingtonshire is more to the eastern side of Scotland than any other I visited. The growth of the trees and shrubs, however,

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appeared to me to be quite as luxuriant as in Perthshire, the proximity of the North Sea and the Firth of Forth, I suppose, accounting for this. The conifers were especially good, some of them better than I saw elsewhere. *Cupressus macrocarpa*, 72 feet high and 7 feet 6 inches in girth, was finer on the whole than any other I met with, though one on Sir Herbert Maxwell's estate almost rivals it. *Sequoia gigantea*, said to have been received from Kew as a small plant soon after the species was introduced, is now 90 feet high and girths 13 feet 6 inches. Its ally, *S. sempervirens*, was 66 feet high and 9 feet 3 inches in girth, and therefore about the same size as our biggest Kew specimen. *Tsuga canadensis* has the big bushy head characteristic of the tree in Scotland, 40 feet through. *Abies nobilis* is represented by a noble specimen approximately 100 feet high, with a trunk 8 feet 10 inches in girth. *Picea Morinda* was 72 feet high and 7 feet 9 inches in girth. *P. sitchensis*, of which I saw elsewhere such large trees, is here almost as fine as anywhere—90 feet high and 10 feet 4 inches in girth; as an ornamental tree, however, it has one frequent defect, the centre of the tree being filled with dead branches and twigs which the outer fringe of living growth is not dense enough to hide. Other trees finely represented were *Pinus excelsa*, *P. insignis*, Douglas Fir, *Abies Pinsapo*, and *A. grandis*, all girthing about 8 feet. A good specimen of the cut-leaved Oak, *Quercus pedunculata* var. *heterophylla*, was 54 feet high. Of big shrubs, I noted *Neillia opulifolia*, 30 feet through, and *Spiraea discolor*, 20 feet high.

MONREITH.

Monreith is situated near the end of the promontory in Wigtownshire that juts out towards the Isle of Man, between Luce Bay and Wigtown Bay. Being almost on the extreme south-west of Scotland, with water on three sides, the climate is necessarily mild and moist, and suited to many forms of tree and shrub growth. How rapidly some of these grow will be seen from the following notes. Monreith is the home of Sir Herbert Maxwell, who, among his many interests, regards forestry, I believe, as not the least.

Pinus insignis, planted in the winter of 1883–4, is now 65 feet high, its growth clean and erect, and that of a single year sometimes over 4 feet in length. *P. monticola*, planted in 1875, is 63 feet high and 4 feet 5 inches in girth. *Cupressus macrocarpa*, planted less than thirty years ago, is 60 feet high, with a trunk 7 feet 5 inches in girth—a model of health and vigour. These three trees are perhaps the most notable examples of rapid growth, but other evidences of the generous climate are to be seen in the fine trees of *Thuya gigantea*, *Juniperus virginiana*, *Cupressus nootkatensis*, *C. sempervirens*, and *Abies nobilis*. In some plantations of Scots Pines and Larches made by Sir Herbert a few years ago it was interesting to note that a few specimens of the Japanese *Picea ajanensis* were making the best headway, the "leads" of some this season being already over 2 feet long. *Abies nordmanniana*, although it evidently grew well in its early days, has proved a failure owing to the attacks of a scale insect and of a fungoid pest—*Peridermium elatinum*—which causes curious gouty, barrel-shaped protuberances on the branches.

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There is a charming old-fashioned garden attached to the house where are growing some striking shrubs. I noted *Rhododendron barbatum*, *Chionanthus virginica*, 10 feet high and as much through, and *Olearia Haastii*, 9 feet high and 15 feet through. *Lilium giganteum* is perfectly at home here; one spike I saw carried twenty flowers.

Castle Kennedy.

Castle Kennedy is close to Loch Ryan, in Wigtownshire, and a long way to the south-west of Perthshire. The climate, whilst equally moist, is considerably warmer, and a different class of trees and shrubs is growing here. Escallonias, for example, especially *E. macrantha*, thrive as well as they do in Cornwall, and are evidently held in about the same esteem as Laurels in less favoured places. Callistemons were flowering freely, and *Eucalyptus Globulus* was 35 feet high. *Olearia macrodonta*, which I saw so fine at Inverewe, in Ross-shire, was here equally good. The prevailing type of Rhododendron is Himalayan, either the pure species (especially *R. arboreum*, *R. Thomsoni*, and *R. campanulatum*) or hybrids in which their "blood" predominates. A further evidence of the character of the climate was afforded by *Richardia aethiopica* growing in an open pond, and flowering freely.

I should think Castle Kennedy is one of the best watered inland demesnes in Britain. The gardens are situated chiefly on a neck of land between two lochs known as "Black" and "White" respectively, and there are several ponds and minor pieces of water besides. From a landscape point of view, one of the remarkable features of the place is the amount of terracing that has been done. Many of the natural mounds and hollows have been squared and trimmed, the slopes made into terraces, and the ponds rounded. There are also formal elevated mounds from which good views of the gardens and lochs are to be seen. This kind of landscape art was more to the taste of a bygone time than it is to that of the present day. When newly done, its aspect must have been crude and hard, but the softening hand of time has done much to ameliorate its hard lines, and where an arboreal vegetation does not grow, a thick, well-kept turf covers it all. We may say of this phase of Castle Kennedy, what applies equally well to the formal garden at Drummond, and to the topiary work of Levens: one may not care to copy it, but it is in its way unique, and one would be sorry were it to be destroyed.

Here, as in so many Scottish gardens, the conifers are the chief objects of interest. *Araucaria imbricata* is very fine, and produces cones regularly; there is a striking avenue of large specimens, one of which (it may not have been the largest) had a trunk 7 feet in girth. Equally striking to me, and less bizarre in its effect, was an avenue of *Cupressus macrocarpa*; one of the tallest was 60 feet high; another, branching low, was 9 feet 8 inches in girth at two feet from the ground. I saw many excellent specimens of various Silver Firs: *Abies webbiana*, girthing 6 feet, with its naturally sown seedlings springing up around; *A. nordmanniana*, also self-sown; *A. cephalonica*, 63 feet high and 9½ feet in girth; the rare Himalayan *A. Pindrow*, 60 feet

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high and 4 feet 5 inches in girth; the still rarer *A. religiosa*, from Mexico (the only specimen I saw in Scotland), 40 feet high; *Picea polita*, 20 feet high, well-furnished and well-formed; and *Cryptomeria japonica*, 50 feet high, with the unusual girth of 6 feet 3 inches.

The Holm Oak is not so fine individually here as it is at Kew, but a grove of forty of them gave one an idea of the "Ilex" woods of Southern Europe. I have already alluded to the Rhododendrons, but all the ericaceous plants are remarkably well-grown. *Pieris floribunda* was 10 feet high, the scarce *P. mariana*, 7 feet high and through, *Kalmia angustifolia*, 6 feet high, Cassandras, 4 feet high, and many more equally notable.

W. J. B.

XLV.—MISCELLANEOUS NOTES.

C. B. Clarke.—Mr. Charles Baron Clarke, M.A., F.R.S., eldest son of the late Mr. Turner Poulter Clarke, J.P., of Andover, Hampshire, who died on August 25th, 1906, had been for many years intimately associated with the Herbarium at Kew, where he was employed, as an Indian officer on special duty, from March, 1879, till April, 1883, in assisting Sir Joseph Hooker to prepare the *Flora of British India*. When he retired from the service of the Government of India, in June, 1887, he settled at Kew in order to be near the Herbarium, in which he has been a volunteer for the past 19 years, associating himself in the most wholehearted manner with the interests of the establishment and the furtherance of its work. By the members of the staff, whom he treated as friends and colleagues, and by visitors to the Herbarium of every nationality, his death will be felt as a personal loss. The extreme unselfishness and unfailing kindness with which, sometimes it is to be feared at the expense of his own special studies, he placed at the disposal of other workers his extensive knowledge of the flora of India generally and his minute acquaintance with certain natural families, particularly the *Cyperaceae*, with regard to which he was the recognised authority, can never be forgotten.

After having been at King's College School, London, Mr. Clarke proceeded to Cambridge, where he was a member of Trinity College and afterwards of Queen's. When he graduated in 1856 he was bracketed Third Wrangler; in the following year he was elected a Fellow of Queen's College. In 1858 he was called to the Bar at Lincoln's Inn and appointed Mathematical Lecturer of his college. He was thus occupied till 1865, and in 1866 he left for India to join the Educational Department in Bengal, where he served as one of the staff of the Presidency College, Calcutta, and afterwards as an Inspector of Schools. From 1869 till 1871 he acted as Superintendent of the Royal Botanic Garden at Shibpur, near Calcutta, afterwards reverting to the Educational Department, to the first grade in which he was promoted in March, 1876. In 1877 he returned to Europe on two years' furlough. In 1879, as already stated, he was placed, when his leave expired, on special duty in England. Returning to India in 1883, he was, in

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December, 1884, appointed officiating Director of Public Instruction in Bengal. In March, 1885, he was transferred as Inspector of Schools to the province of Assam, where he served till his retirement at the age of 55 in 1887.

Mr. Clarke early developed an inclination towards field-botany. While at Cambridge he paid several visits to the north of England, some to Scotland and to Switzerland, and one, in 1862, to Madeira. During most of these excursions, as his private collections show, he collected plants largely, but his principal field was North Hampshire, his own country. Before leaving for India he had prepared a list of the plants of his birthplace, Andover, which he printed in Calcutta in 1866. As an Inspector of Schools he had ample opportunities during his official tours for studying the vegetation of the plains of Bengal. He supplemented these by vacation journeys to other parts of India. His temporary connection with the Royal Botanic Garden at Calcutta enabled him to study the material in the Herbarium attached to that institution, but the pressure of official and administrative duties left him less time for sustained botanical work than he would have wished, and he occasionally complained that he was able to do less real botanical work during a year of this superintendentship than he could accomplish in a month in his travelling appointment. His herbarium work during this period did, however, lay the foundation for at least two of his published works, those on the Indian *Cyrtandraceae* and on the Indian *Commelynaceae*, published in 1874. At this time too he worked very thoroughly through the Indian *Urticaceae*. It may serve a useful purpose if a brief epitome of Mr. Clarke's various Indian journeys be given here.

Mr. Clarke was at first appointed to the Eastern Bengal School division, where the only practical mode of conveyance is by boat. During the wanderings of two and a half years he made extensive collections, which reached more than 7,000 numbers. At this time he appears to have paid particular attention to the *Commelynaceae* on which he made critical observations. Early in 1868 he lost the whole of his collections from Eastern Bengal owing to the wreck of his boat. Not at all discouraged, in May of that year he was again collecting in Sylhet, and in September he was able to pay a visit to the Madhopur jungles in Western Mymensingh, an interesting tract where low hills, densely covered with a forest unlike that of the adjacent plain, crop up through the Bengal alluvium. In August, 1869, he paid his first visit to Sikkim, but was too closely engaged on his work at the Cinchona plantation to be able to do much collecting. In October, however, he was able to make a rapid march from Darjeeling to the Yakla, a pass near but somewhat to the south of the Chola. Duties connected with the Cinchona Department took him to Southern India in March, 1870, when he was able to make a considerable collection in the Nilgiri Hills. In 1871 he was again in Sikkim but with little time for collecting.

On reverting to his work as Inspector, we find that in September, 1871, Mr. Clarke was botanising in Comilla, his field numbers now exceeding 14,000; in February, 1872, he was collecting in Barisal and the Eastern Sundribuns; in April he was

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botanising in the Dacca district, and in December was investigating the vegetation of Cachar. In February, 1873, he paid a botanical visit to Chittagong; Calcutta now became his headquarters, and in 1874 we find that he paid his first visit to Chutia Nagpur, and that he spent six weeks in the Punjab Himalaya, mainly at Dalhousie, whence he was able to make excursions at least one of which was to an elevation of 10,000 feet. On his return to Calcutta he paid a visit to the Western Sundribuns. In 1875 he was transferred to the Northern Division, with his headquarters at Darjeeling, but before leaving Calcutta we find that he made a special study of the genus *Leea*. From Darjeeling he made a botanical excursion along the Nepal frontier to Tonglo, and as he had already been at the Chola to the east, in October, 1875, he visited Jongri, going by way of Pemionchi and Yoksun, returning by Singalelah. Immediately on his return from Jongri he paid a brief visit to British Bhutan east of the River Tista. The next three months, from November, 1875, to February, 1876, were spent touring in the plains of North Bengal. By this time the *Cyperaceae* and *Gramineae* had become his favourite natural orders. On returning to Darjeeling he had an opportunity of paying a spring visit to the higher passes, going to Tumloong and on to the Chola, crossing from there, keeping to the west side of the ridge, the head of the Northern Yakla into the head of the South Yakla, thence down to Dikeeling, thence across to Rhenok in British Bhutan. Owing to the snow still lying deep on the passes this journey, an official one, was not very productive as regards high elevations; rather lower down he was able to give especial attention to the Rhododendrons. On June 19th, 1876, Mr. Clarke started from Darjeeling on his longest and most arduous journey. He had three and a half months at his disposal and arranged to devote them to an examination of the flora of Kashmir. He entered that country by the ordinary high level road from Bhimpur to Srinagar, then went north by the Woolar Lake, straight across the Devil's plain to Iskardo. Crossing the Indus he went from there north into the Karakoram Mountains going as far as the great Bardomail glacier and getting well into High Asia, crossing one pass at over 17,000 feet and on several occasions reaching the highest limits of phanerogamic vegetation. On his return journey, Mr. Clarke passed near Dras into the Tilail valley, then crossed at right angles in succession the valleys of the Sind, Liddar, Jhelum, Wardwan and Ravi rivers to Amritsar. During the whole of this journey Mr. Clarke was, almost for the first time in his life, more or less unwell. After returning from this journey he spent the following cold weather touring in the northern part of Bengal; at the commencement of the hot season of 1877 he left for England on long furlough; he paid a short visit to Italy on the way home. On reaching England he settled down at Kew, his first attendance at the Herbarium there was on June 9th, 1877. He made over the whole of his collections to the Herbarium at Kew. This donation is referred to in the *Kew Report* for 1877 in the following terms:—

"The Indian Herbarium of Mr. C. B. Clarke, which is a most "munificent addition to our already unrivalled collections "illustrating the flora of our Indian Empire. This herbarium "contains 25,000 numbers, representing about 5,000 species. It

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"was collected in the following provinces:—Plains of Bengal, "Khasia, and Chittagong hills, Chota Nagpore, Dalhousie and "Chumba, Kashmir to the Karakorum, Nilgheries. It contains a "large number of field-notes, the exact locality and elevation of "every plant, and some rough botanic analyses."

On returning to India—he reached Calcutta on 2nd April, 1883—Mr. Clarke was appointed Inspector of Schools at the Presidency with his headquarters at Calcutta. In the beginning of October he left for Chutia Nagpur where he made a ten weeks' march in the course of which he ascended Parasnath, and was able to get as far as Sirguja, a native state in south-western Chutia Nagpur, bordering on the upper Mahanaddi, where the plateau reaches an elevation of from 2,000–4,000 feet. Early in 1884 he paid brief botanical visits to various parts of Central Bengal, but his movements were hampered by his having to take up the duties of Professor of Mathematics at the Presidency College, Calcutta, owing to the death of the permanent incumbent. He was in October able, however, to make a journey of 26 days' duration in Lower Sikkim and in the Terai and the Duars, but his College duties disappointed him of an opportunity that had offered of accompanying a political mission which proceeded through Northern Sikkim to the Tibet frontier. His transfer to Assam in 1885, where as Inspector of Schools his headquarters were at Shillong, afforded Mr. Clarke opportunities of adding considerably to his collections from the Khasia and Jaintea Hills. Early in 1885 he was able to pay a visit to Upper Assam, reaching Dibrugar and Sadiya, and getting as far as Namchung in the Eastern Naga Hills at an elevation of 3,000 feet, by a route parallel to Griffith's Namrup route. In August he was able to pay a visit of 10 days' duration to the Kollong Rock and Nungklao, a locality rendered classical by reason of the investigations made there by Hooker and Thomson. In September, 1885, he paid a botanical visit to Cherrapungi, and on the last day of the month he set out for the Angami Naga country. His route lay through the Nambar Forest to Kohima. From Kohima he was able to ascend Japvo, the highest peak, 9,890 feet elevation, of the Bareil range. Thence he went to Manipur, an independent State between Assam and Burma, returning to Shillong by way of Silchar early in 1886. Almost immediately after his return he set out on a three months' tour, mainly in Lower Assam, and was able to make several subsequent collecting journeys before he finally left Assam and India in 1887. The collections accumulated during the second portion of his Indian service were presented to Kew after his return to England.

It will be seen therefore, that during his service in the East Mr. Clarke was able to obtain a personal knowledge of the vegetation of India comparable in extent with that acquired by Hamilton or Wallich or Hooker and second only to that attained by Griffith.

Mr. Clarke was an admirable collector; his specimens are rarely incomplete and are always carefully selected and prepared. They are accompanied by clear and often full field-notes always given on the actual field-ticket, sometimes accompanied by rough analyses made at the time of collecting. Every gathering

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has a distinct number so that an erroneous citation is an impossibility; those who have travelled in his company tell us that the collections of a particular day were invariably dealt with before he retired to rest for the night, no matter how long the march may have been or how arduous the conditions under which it was made. Throughout his life he paid little attention to trees; as a collector of herbaceous plants and of shrubs he has perhaps never been surpassed.

Prior to and during the period of his deputation in England Mr. Clarke published a number of papers on botanical subjects in the *Journal of the Linnean Society* and the *Journal of Botany*, almost exclusively relating to Indian plants. Here, however, our chief interest centres in what he prepared at and on behalf of Kew. During the time he was on furlough in England (1877–79), and during the subsequent period of his deputation (1879–83), he elaborated the following natural families for the *Flora of British India*:—In vol. ii.: *Saxifragaceae*, *Crassulaceae*, *Droseraceae*, *Hamamelideae*, *Halorageae*, *Combretaceae*, part of *Myrtaceae*, *Melastomaceae*, *Lythraceae*, *Onagraceae*, *Samydaceae*, *Cucurbitaceae*, *Begoniaceae*, *Datisceae*, *Cacteae*, *Ficoideae*, *Umbelliferae*, *Araliaceae* and *Cornaceae*. In vol. iii.: *Caprifoliaceae*, *Valerianeae*, *Dipsaceae*, *Stylideae*, *Goodenovieae*, *Campanulaceae*, *Vaccinieaceae*, *Ericaceae*, *Monotropeae*, *Epacrideae*, *Diapensiaceae*, *Plumbagineae*, *Myrsineae*, *Sapotaceae*, *Ebenaceae*, *Styraceae*, *Oleaceae* and *Salvadoraceae*. In vol. iv.: *Loganiaceae*, *Gentianaceae*, *Polemoniaceae*, *Hydrophyllaceae*, *Boragineae*, *Convolvulaceae*, *Solanaceae*, *Lentibularieae*, *Gesneraceae*, *Bignoniaceae*, *Pedalineae*, *Acanthaceae* and *Verbenaceae*.

He also prepared, largely at Kew, monographs of the *Commelinaceae* and of the *Cyrtandreae*, published in 1881 and 1883 respectively, for De Candolle's *Suites au Prodrome*.

The group *Glumaceae*, as numerous notes on specimens in the Calcutta Herbarium show, appears to have early attracted Mr. Clarke's attention; as time went on this attention became more particularly concentrated on the *Cyperaceae*.

He was not able to give much time to the study of this family while on duty at Kew between 1879 and 1883 till towards the close of the period, when he published in the last-mentioned year, in the Linnean Society's Journal, accounts of the Madagascar species of *Cyperus* and of the genus *Hemicarex* and its allies. During the last two months of his residence in England, advantage was taken of his special knowledge in having the Indian species of the genus *Cyperus* at Kew rearranged. When Mr. Clarke left for India Sir Joseph Hooker requested him to publish the results of this work so as to assist later on in the elaboration of the genus for the *Flora of British India*. On reaching India Mr. Clarke was able to consult and similarly rearrange the rich Indian material of the genus in the Calcutta Herbarium; thereafter, he published a review of the Indian species of *Cyperus* in the *Journal of the Linnean Society* for 1884.

On retiring from India Mr. Clarke gave the greater part of his time to the further study of *Cyperaceae*, his object being to complete a general monograph of this difficult family. As the

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work progressed he became by degrees the recognised authority on the subject, to whom botanists of every nationality sent their collections from all parts of the world for identification. As a consequence his monograph, which unfortunately has not yet been published, received additions up to the time of his death.

His devotion to this family even after his retirement, when, at the request of Sir J. D. Hooker and Sir W. T. Thiselton-Dyer, he elaborated accounts of it for the *Flora of British India*—published 1893–4; for the *Flora Capensis*—published 1897–8; for the *Flora of Tropical Africa*—published 1901–2; and for the *Index Florae Sinensis*—published 1903–4, was by no means exclusive; he found time to prepare accounts of the natural families *Gesneraceae*, *Acanthaceae* and *Commelynaceae*, both for the *Flora Capensis* and the *Flora of Tropical Africa*; and for the latter work accounts, not yet published, of the *Amarantaceae* and the *Chenopodiaceae*. For the *Flora of the Malayan Peninsula* he elaborated the *Gentianaceae* and the *Acanthaceae*, the latter not yet issued. He had also practically completed a continuation of Lowe's *Flora of Madeira*; he was engaged when overtaken by his fatal illness in collecting materials for an introductory memoir of the late Rev. R. T. Lowe.

His minute knowledge of the *Cyperaceae* was made the basis of an important paper on biologic regions and tabulation areas, published in the *Philosophical Transactions* in 1892, and was applied to the further discrimination of sub-subareas in the tabulation area of British India in another important paper published in the Linnean Society's Journal in 1898.

Of Mr. Clarke's attainments in other directions and of his wide knowledge of non-botanical subjects this is not the place to speak. Lucid and incisive, his correspondence was to be treasured. Courteous, unselfish and modest as he was versatile and informed, his conversation had an indescribable charm. His death leaves a blank in the Herbarium hardly to be filled; not Kew alone, but systematic botany everywhere is the poorer for this loss.

Below is given as complete a list as possible of Mr. Clarke's contributions to botanical literature :—

LIST OF BOTANICAL CONTRIBUTIONS BY C. B. CLARKE, M.A., F.R.S.

A list of the Flowering Plants of Andover. Calcutta, 1866. 8vo. pp. 114. With map.

Commelynaceae et Cyrtandraceae bengalenses. Calcutta, 1874. fol. pp. 139 + ii., tt. 93.

Compositae indicae descriptae et secus genera Benthamii ordinatae. Calcutta, 1876. 8vo. pp. v. + xxiv. + 347 + xlv.

Roxburgh, Flora indica . . . reprinted literatim from Carey's edition of 1832. Preface by C. B. Clarke. Calcutta, 1874. 8vo.

Commelinaceae in DC. Monogr. Phan. iii. 113–324, tt. 1–8. (1881.)

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Cyrtandreae in DC. Monogr. Phan. v. pars 1, 1–303, tt. 1–32. (1883.)

Hooker, J. D., Flora of British India.

ii. 388–411. Saxifragaceae (1878).
ii. 411–423. Crassulaceae (1878).
ii. 423–425. Droseraceae (1878).
ii. 425–430. Hamamelideae (1878).
ii. 430–434. Haloragеae (1878).
ii. 443–461. Combretaceae (1878).
ii. 506–512. Myrtaceae (Barringtonieae) (1879).
ii. 512–565. Melastomaceae (1879).
ii. 565–581. Lythraceae (1879).
ii. 582–590. Onagraceae (1879).
ii. 590–598. Samydaceae (1879).
ii. 604–635. Cucurbitaceae (1879).
ii. 635–656. Begoniaceae (1879).
ii. 656–657. Datisceae (1879).
ii. 657–658. Cacteae (1879).
ii. 658–665. Ficoideae (1879).
ii. 665–720. Umbelliferae (1879).
ii. 720–740. Araliaceae (1879).
ii. 740–748. Cornaceae (1879).
iii. 1–17. Caprifoliaceae (1880).
iii. 210–215. Valerianeae (1881).
iii. 215–219. Dipsaceae (1881).
iii. 419–420. Stylideae (1881).
iii. 420–421. Goodenovieae (1881).
iii. 421–442. Campanulaceae (1881).
iii. 442–455. Vacciniaceae (1881–2).
iii. 456–476. Ericaceae (1882).
iii. 476–477. Monotropeae (1882).
iii. 477. Epacrideae (1882).
iii. 478. Diapensiaceae (1882).
iii. 478–481. Plumbagineae (1882).
iii. 482–506. Primulaceae (1882).
iii. 507–534. Myrsineae (1882).
iii. 534–549. Sapotaceae (1882).
iii. 549–572. Ebenaceae (1882).
iii. 572–590. Styraceae (1882).
iii. 590–618. Oleaceae (1882).
iii. 618–620. Salvadoraceae (1882).
iv. 78–93. Loganiaceae (1883).
iv. 93–132. Gentianaceae (1883).

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iv. 133. Polemoniaceae (1883).
iv. 133–134. Hydrophyllaceae (1883).
iv. 134–179. Borragineae (1883).
iv. 179–228. Convolvulaceae (1883).
iv. 228–246. Solanaceae (1883).
iv. 328–336. Lentibularieae (1884).
iv. 336–375. Gesneraceae (1884).
iv. 376–386. Bignoniaceae (1884).
iv. 386–387. Pedalineae (1884).
iv. 387–558. Acanthaceae (1884–5).
iv. 560–604. Verbenaceae (1885).
vi. 585–748. Cyperaceae (1893–4).

Thiselton-Dyer, Sir W. T., Flora of Tropical Africa.

iv. Sect. ii. 499–512. Gesneraceae, by J. G. Baker and C. B. Clarke (1906).
v. 1–262. Acanthaceae, by I. H. Burkill and C. B. Clarke (pp. 44–261 by C. B. Clarke only) (1899-1900).
viii. 25–88. Commelinaceae (1901).
viii. 266–524. Cyperaceae (1901–02).

Thiselton-Dyer, Sir W. T., Flora Capensis.

v. 1–92. Acanthaceae (1901).
vii. 7–15. Commelinaceae (1897).
vii. 149–310. Cyperaceae (1898).

Philippine Acanthaceae. Department of the Interior. Bureau of Government Laboratories. No. 35, 89–93 (1905).

Journal of Botany.

vi. 215–218. A list of Andover Plants (1868).
xix. 100–106, 135–142, 163–167. A Revision of the Indian Species of Leea (1881).
xix. 193–202. Notes on Commelinaceae (1881).
xx. 369–370. Fertilization of Ophrys apifera (1882).
xxv. 267–271. Eleocharis. Species in Europa vigentes recensuit C. B. Clarke (1887).
xxvi. 201–204. Root-Pressure (1888).
xxviii. 18–19. On Cyperus Jemenicus, *Rottb.* (1890).
xxix. 225–228. On Epilobium Duriaei, *J. Gay*, a new (?) English Plant (1891).
xxx. 155–158. Annals of the Royal Botanic Garden, Calcutta (rev.) (1892).
xxx. 321–323. On Holoschoenus, *Link* (1892).
xxxi. 135–138. Collectors' Numbers (1893).
xxxi. 182–183. Abnormal Spring (1893).
xxxi. 211–212. Reminiscences of Alphonse De Candolle (1893).

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xxxii. 116–120. Vesque's "Guttiferae" (rev.) (1894).

xxxii. 345–347. Prain's "Memoirs" (rev.) (1894).

xxxiv. 224–226. New East African Cyperaceae (1896).

xxxiv. 415–417. List of British Cyperaceae (excluding Carex) (1896).

xxxv. 71–73. Distribution of Three Sedges (1897).

xxxviii. 278. Impatiens glandulifera, *Royle* (1900).

Journ. Linn. Soc.

xi. 438–454. Commelynaceae of Bengal (1870).

xiv. 8. Hydrotrophus, a new genus of Hydrocharidaceae (1873).

xiv. 410. On Hieracium silhetense, *DC.* (1875).

xiv. 423–457. On Indian Gentianaceae (1875).

xv. 113. On Edgaria (1876).

xv. 116–159. Botanic Notes from Darjeeling to Tonglo (1876).

xvii. 159. Two kinds of Dimorphism in Rubiaceae (1878).

xvii. 310. On Gardenia turgida, *Roxb.* (1879)

xvii. 402. Ferns of North India (1879).

xviii. 114-132. On Indian Begonias (1880).

xviii. 468. Right- and Left-hand Contortion (1881).

xviii. 524. Dimorphism in Arnebia and Macrotomia (1881).

xix. 206. On Orchis incarnata, *Linn.* (1882).

xix. 289. On two Himalayan Ferns (1882).

xx. 279–296. Madagascar Species of Cyperus (1883)

xx. 374–403. On Hemicarex, *Benth.*, and its allies (1883).

xxi. 1–202, tt. 1–4. On the Indian Species of Cyperus; with remarks on some others (1884).

xxi. 252–255. Notes on the Flora of Parasnath, North-western Bengal (1884).

xxi. 384–391. Botanic Notes from Darjeeling to Tonglo and Sundukphoo (1885).

xxii. 128–136. Botanical Observations made in a Journey to the Naga Hills (1886).

xxiv. 407. On Panicum supervacuum, sp. nova (1888).

xxiv. 408–418. Supplementary Note on the Ferns of Northern India, with J. G. Baker (1888).

xxv. 1–107, tt. 1-44. On the Plants of Kohima and Muneypore (1889).

xxx. 299–315. On certain authentic Cyperaceae of Linnaeus (1894).

xxxiv. 1–146, t. 1 (map). On the Subsubareas of British India, illustrated by the detailed distribution of the Cyperaceae in that Empire (1898).

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xxxiv. 295–299. On Carex wahlenbergiana (1899).

xxxv. 403–405. Note on Carex Tolmiei, *Boott*.

xxxvi. 202–319. Enumeration of all the Plants known from China Proper, etc. Cyperaceae (1903–04).

xxxvii. 1–16. List of the Carices of Malaya (1904).

Proc. Linn. Soc.

(1880–82), 35. Species of Orchis exhibited.

(1894–95), 14–29. Presidential Address to the Linnean Society. On the Soondreebun of Bengal (1896).

(1895–96), 17–29. Presidential Address. Collectors' Numbers. Observations on Sedges, etc. (1896).

Trans. Linn. Soc.

ser. 2, iii. 395–398. Determined the Cyperaceae of the Malay Peninsula (1893).

ser. 2, iv. 244–246. Determined the Cyperaceae of the Flora of Mt. Kinabalu (1894).

ser. 2, iv. 498. Determined the Commelynaceae of the Matto Grosso Expedition (1895).

ser. 2, iv. 511–513. Determined the Cyperaceae of the Matto Grosso Expedition (1895).

Phil. Trans. Roy. Soc., B, 1892, pp. 371–387, tt. 24 & 25. On Biologic Regions and Tabulation Areas (1893).

Proc. Roy. Soc., lxx. 496–498. Antarctic Origin of the Tribe Schoenae (1902).

Engl. Bot. Jahrb.

xxx. Beibl. 68, 1–44. Cyperaceae (praeter Caricinas) chilenses (1901).

xxxiv. Beibl. 78, 1–6. Sodiro, Plantae ecuadorenses. Cyperaceae (1904).

xxxviii. 131–136. Engler, Beiträge zur Flora von Afrika, xxix. Cyperaceae africanae (1906).

Bot. Tidsskrift.

xxiv. 23–38. Schmidt, Flora of Koh Chang. Cyperaceae (1901).

xxiv. 139–146.—Compositae, Umbelliferae (1902).

xxiv. 192–201.—Lythraceae, Melastomaceae, Scrophulariaceae, Acanthaceae (1902).

xxvi. 323–328.—Verbenaceae, Labiatae (1904).

Bull. l'Herb. Boiss.

iv. Append. iii. 28–33, 35–36. Schinz, Die Pflanzenwelt Deutsch-Südwest-Afrikas. Cyperaceae und Commelinaceae, bestimmt von C. B. Clarke (1896).

vi. Append. i. 19–24. Chodat, Plantae Hasslerianae. Cyperaceae und Commelinaceae (1898).

vii. 892. Schinz, Beiträge zur Kenntnis der Afrikanischen Flora. xi. Cyperaceae, bestimmt von C. B. Clarke (1899); continued in Mem. l'Herb. Boiss. n. 10, 25–27 (1900), and 27–28. Commelinaceae (1900).

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sér. 2, iii. 663.—Cyperaceae. Cyperus Schlechteri, *C. B. Clarke*, nov. spec. (1903).

sér. 2, iii. 938–1030. Chodat and Hassler, Plantae Hasslerianae. Cyperaceae (1903).

sér. 2, iv. 995–996. Schinz, Beiträge zur Kenntnis der Afrikanischen Flora. xvi. Cyperaceae (1904).

sér. 2, v. 712–719. Ostenfeld, A list of Plants collected in the Raheng District, Upper Siam, by Mr. E. Lindhard, [chiefly] determined by C. B. Clarke (1905).

sér. 2, vi. 709. Schinz, Beiträge zur Kenntnis der Afrikanischen Flora. xix. Cyperaceae. Mariscus pseudo-vestitus, *C. B. Clarke*, sp. nov. (1906).

Bull. Acad. Int. Géogr. Bot.

xiv. 197–203. Cyperaceae (excl. Carices) japonicae et coreanae a R. P. Urb. Faurie lectae quas determinavit C. B. Clarke et edidit H. Léveillé (1904).

xiv. 204–205. Cyperaceae (excl. Carices) a R. P. J. Cavalerie in Provincia Kouy-Tcheou apud sinenses lectae quas det. C. B. Clarke et ed. H. Léveillé (1904).

Gard. Chron. 1905, xxxviii. 162, f. 55. Schizandra Henryi, *Clarke* (1905).

H. MARSHALL WARD.—After a long and trying illness Prof. Marshall Ward, Sc.D., F.R.S., died on August 26th at the age of 52. During the past 11 years he occupied the Chair of Botany at Cambridge, and his death is a severe loss to the University and to botanical science.

At the beginning of his scientific career in 1874 he attended Prof. Huxley's lectures on Biology at South Kensington; the next year was spent at Owens College, and, in the following year, having gained an entrance scholarship in Natural Science at Christ's College, Cambridge, he continued his studies there, obtaining first-class honours in the Natural Science Tripos in 1879.

Having completed his preliminary scientific education, he at once devoted his energies to botanical research. He studied for a time under Prof. Sachs at Würzburg, and in 1880 published an important paper on the embryo-sac in Angiosperms. This piece of work was carried out at Kew in the Jodrell Laboratory, which had been founded a few years previously for the purpose of affording facilities for research on material supplied by Kew. This work on the embryo-sac is thus one of the early contributions to the long series of researches, which have since been carried out in this laboratory, by a succession of botanists.

In 1880 Marshall Ward was sent by the Government to Ceylon to study the cause of the coffee-leaf disease, and the results of his investigations were published in Ceylon, and in a paper in the Journal of the Linnean Society (1882) on the life-history of the fungus causing this disease. In 1882 he became Assistant Lecturer at Owens College (now the Victoria University); three

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years later he was appointed Professor of Botany in the Forestry Department at Cooper's Hill, and in 1895 was elected to the Professorship at Cambridge.

The following are some of the distinctions conferred on him. He was elected a fellow of the Royal Society in 1888, and was chosen to read the Croonian Lecture in 1890, the subject being "Some relations between host and parasite in certain epidemic diseases of plants." In 1892 the University of Cambridge made him a Doctor of Science, and in the following year the Royal Society awarded him the Royal Medal for his researches into the life-history of Fungi and Schizomycetes. He was president of the botanical section of the British Association at Toronto in 1897, and president of the British Mycological Society from 1900 to 1902.

To return to the scientific work published by Prof. Marshall Ward we can only mention a few out of the large number of papers produced. Some of these deal with the life-history of fungal parasites, *e.g.*, a research on the structure and life-history of *Entyloma Ranunculi* (Phil. Trans., 1887), and "A Lily disease" (Ann. Bot. II., 1888). Others are concerned with bacteria and yeasts. Of these "The Ginger-beer plant and the organisms composing it" is a study of the biology of the dual organism, composed of a yeast and a bacterium symbiotically associated, having special interest in connection with the subject of fermentation; and a paper on symbiosis and symbiotic fermentation was published in the transactions of the Institute of Brewing (1901). A detailed work on the bacteriology of the Thames was carried out in conjunction with Prof. Percy Frankland, F.R.S., in the years 1893–6. In 1894 a paper published in the Philosophical Transactions of the Royal Society recorded a large number of experiments on the action of light on bacteria, and attracted a good deal of public attention, on account of the hygienic aspect of the subject. His later work was largely given to a study of rusts allied to that of the wheat, and very interesting and important results were made known regarding physiological races (biologic forms) of the rust which attacks various species of *Bromus*. This work was published in the Transactions of the Cambridge Philosophical Society (1902) and in other papers.

Besides the original works referred to, Prof. Ward found time to write several books, some dealing with the diseases of plants, and others connected with Forestry. The chief of these are: "Timber and some of its diseases" (1889), "The Oak; a popular introduction to Forest Botany" (1892), "Disease in plants" (1901), "Grasses" (1901), and "Trees" a large book, the publication of which is not yet complete.

All Prof. Ward's work is characterised by extremely careful observation and accuracy of description. His unceasing energy and devotion to his duties have left their mark on the Botanical Department at Cambridge, where the splendid University Laboratories, which were formally opened two years ago, form a fitting memorial to his labours.

L. A. B.

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WILLIAM MITTEN, A.L.S., BRYOLOGIST.—By the death of this gentleman Kew has lost a very old correspondent and a valued collaborator. His first letter to Sir William Hooker is dated December 8th, 1846, and relates to the parasitism of *Thesium linophyllum*, in connection with a paper which appeared in Hooker's "London Journal of Botany" in 1847, and was reproduced in the "Annales des Sciences Naturelles" and other publications.

He was born at Hurstpierpoint, Sussex, on November 30th, 1819, and died in the same place, July 27th, 1906, so that he was in his eighty-seventh year. He was a pharmaceutical chemist by profession and a botanist by predilection. As quite a young man he took up the study of British plants of all classes, and being a keen and critical observer he soon discovered a number of species, especially of mosses, not previously recorded as growing in this country. Through his early discoveries he became acquainted with the late William Borrer of the adjoining parish of Henfield. This acquaintance ripened into friendship and was the means of bringing Mitten under the notice of other botanists, notably Sir William Hooker, through whose influence and support he concentrated his attention more particularly on the Musci and Hepaticae, as to which he soon became a recognised authority. For many years most of the Kew collections of these natural orders were sent to him for elaboration and they formed the basis of most of his publications. His earliest records and contributions appeared in the "Phytologist," from 1842; Hooker's "Journal of Botany," from 1847; the "Annals of Natural History," from 1851; and the "Journal of the Linnean Society," from 1859. Noteworthy amongst his early discoveries, is *Carex montana*, L., which he collected in 1843, near Eridge, Sussex, about a mile south of Tunbridge Wells. This is the first record for Britain; but the species has since been found in most of the southern Counties, from Kent to Devon and Shropshire.

In 1849 Sir William Hooker offered him the Curatorship of his herbarium, in succession to J. E. Planchon; but he had to decline for financial reasons, and the same year he acquired a chemist's business at Hurst, which he carried on, with the assistance of his daughter, Miss Flora Mitten, up to his death.

Among his earlier contributions of greater length to botanical literature are the Hepaticae to Hooker's "Flora Novae Zelandiae," in 1855, and to Hooker's "Flora Tasmaniae," in 1860. His most comprehensive work, the "Musci Austro-Americani," occupies the whole of the twelfth volume of the "Journal of the Linnean Society," and was published in 1869. It contains Latin descriptions of 1,745 species (belonging to 127 genera) including very many new ones. This represented the labour of many years, and was a remarkable achievement for an amateur having a multitude of duties to perform. Richard Spruce's collection formed the foundation of this work, which also includes collections made by Burchell, Weir, Mathews, Jameson and others in South America. It also includes the mosses of that part of Central America which lies within the tropics, of the West Indies, of the Falkland Islands, and of Juan Fernandez, which are not covered by the title.

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Apart from short notes, the Catalogue of Cryptogamic Plants collected by J. Jameson in the vicinity of Quito (Hooker's Kew Journal of Botany, III. (1851) pp. 49–57 and pp. 351–361) was the beginning of a long series of articles on Musci and Hepaticae, chiefly based, as already observed, on Kew collections. Some idea of the extent and comprehensiveness of his work may be gathered from the following imperfect list:—Victoria, Australia (Mueller), 1856; Moulmein (Parish), 1856; India (all collectors), 1859; New Zealand and Tasmania (Archer and others), 1860; Fiji (Milne, Seemann), 1861–2; West Tropical Africa (Vogel, Barter, Mann), 1862–3; Atlantic Islands (Johnson), 1865; North America (Lyall), 1865; China and Japan (Oldham), 1865; Polynesia (Powell), 1869; Tropical America, &c. (all collectors), 1869; Ceylon (Thwaites), 1873; Island of St. Paul (Milne, Strange), 1875; Challenger Expedition (Moseley), 1877; Kerguelen (Eaton), 1877; Cape of Good Hope (Eaton), 1878; Rodriguez (Balfour), 1879; Polynesia (Milne and others), 1883; Australia (all collectors), 1883; Remote Islands of the Atlantic and Southern Oceans and the South-Eastern Moluccas (various collectors), 1884–5; Japan (all collectors), 1891; and Borneo (all collectors), 1894. The last was prepared jointly with Mr. C. H. Wright, of the Kew Herbarium.

Although Mr. Mitten accomplished so much, he was personally almost unknown in botanical circles. He very rarely visited London, and more rarely Kew. His work was all done at home and mostly between whiles at his pharmacy. Before Miss Flora Mitten became a qualified dispenser he was very much tied, and, as he explained in one of his letters to Sir W. Hooker, Sunday was the only day that he was free or partially free. Writing in 1854, he states that he had only been absent from home two week-days during five years. By those who knew him he was very highly esteemed for his gentle manners, his kind disposition, his readiness to help, his modesty in discussion, and his reverence for the truth.

Mittenia, Lindberg, a genus of mosses, comprising two Australasian species, commemorates the deceased.

Mittenia, Gottsche (Hepaticae), is the same as *Pallavicinius*, Gray.

Mitten was elected an Associate of the Linnean Society of London in 1847, and he was an honorary member of several Colonial and local Scientific Societies.

W. B. H.

Mesembryanthemums.—No better proof of the decline of what has been termed the collector-spirit in horticulture during the last half century can be found than in the position now occupied by such genera as *Erica*, *Aloe*, *Agave*, *Pelargonium*, and *Mesembryanthemum*. Even Orchids show the same change, collector-cultivators priding themselves more on the commercial value of rare or peculiarly marked varieties and hybrids of garden origin than on the extent and richness in species of their collections. The beautiful Cape heaths grown in English collections half a century and more ago, and figured in Andrew's *Heathery* have

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nearly all gone out of cultivation, not, as is popularly believed, because of difficulties experienced in their cultivation, but because horticultural taste or fashion has changed. And this is true of other genera which during the period named had many admirers among English horticulturists. Twenty-three years ago Sir Joseph Hooker wrote :—"There are many good reasons for encouraging the cultivation of the *once* favourite genus *Mesembryanthemum*, amongst which not the least is their duration, for when once established they need never be lost; they are, further, evergreen, cost little in soil or cleaning, and many of them are amongst the most brilliantly coloured greenhouse plants." There has always been a good collection of the species at Kew, where they are grown in the house devoted to certain South African plants, except during the summer, when they are placed outside. They fail, however, to arouse the interest of horticulturists, although at certain seasons the display of their many-coloured, daisy-like flowers is bright and pleasing. Many of the species are remarkable for quaintness of structure in leaf, and there are few more striking plants than such species as *M. truncatellum*, *M. Bolusii*, *M. tigrinum*, *M. calamiforme*, and *M. testiculare*.

In the hope that the attention of cultivators may be restored to them a list is given here of the Mesembryanthemums now in cultivation at Kew. It comprises over 100 species, and although only about one-third of the number known to botanists these are representative of the characteristics of the genus. The following particulars, showing the position Mesembryanthemums have held in horticulture from the earliest times, accompanied the plate of *M. calamiforme* in the *Botanical Magazine*, t. 7775 (1901). "The genus *Mesembryanthemum* holds an important place in the history of horticulture. Dillenius, who treats of the species known to him at great length, gives an interesting account of the successive introduction of those known to his predecessors. Of these, he says, 15 were known to Bobart (1648); 20 to Breyn (1680); 39 to Ray (1686); 23 to Herman (1687); 21 to Plukenet (1696); 30 to Bradley (1716); 36 to Tournefort. Dillenius himself describes and figures 47 species, all cultivated in Sherard's Garden at Eltham in 1732. Following Dillenius, Linnaeus in the *Hortus Cliffortianus* (1737) gives 30 species; and in the *Species Plantarum* (1753) 35, where he reduces some of Dillenius' species to varieties. Coming down to later times, Aiton's *Hortus Kewensis* (1789) contains 70 species, and the 2nd edition (1811) no less than 175." This appears to have been the high-water mark of the genus, so far as Kew is concerned. In 1899 there were 113 species in cultivation at Kew, the number at the present time being 108. There are 25 species figured in the *Botanical Magazine*.

MESEMBRYANTHEMUM, L. FICOIDEAE.

M. abbreviatum, *Haw.* Salm-Dyck, Mes. §19, t. 5	Australia.
M. acinaciforme, *L.* Salm-Dyck, Mes. §19, t. 6	South Africa.
M. adscendens, *Haw.* Salm-Dyck, Mes. §8, t. 4	„
M. aequilaterale, *Haw.* Salm-Dyck, Mes. §19, t. 1.	Australia and South America.

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M. amoenum, *Salm-Dyck*, Mes. §27, t. 2 ...	South Africa.
M. angustum, *Haw.*	„
M. aurantiacum, *Haw.* Salm-Dyck, Mes. §25, t. 2	„
M. aureum, *L.* Bot. Mag., t. 262	„
M. australe, *Sol.* Salm-Dyck, Mes. §18, t. 2	Australia and New Zealand.
M. barbatum, *L.* Bot. Mag., t. 70	South Africa.
M. bigibberatum, *Haw.* Salm-Dyck, Mes. §7, t. 4	„
M. blandum, *Haw.* Bot. Reg., t. 582... ...	„
M. Bolusii, *Hook.* Bot. Mag., t. 6664... ...	„
M. Brownii, *Hook.* Bot. Mag., t. 6985 ...	„
M. bulbosum, *Haw.* Salm-Dyck, Mes. §52, t. 3	„
M. caespitosum, *N.E.Br.*	„
M. calycinum, *Haw.* Salm-Dyck, Mes. §51, t. 3	„
M. candens, *Haw.* Salm-Dyck, Mes. §51, t. 4	„
M. caulescens, *Mill.* Salm-Dyck, Mes. §30, t. 1	„
M. coccineum, *Haw.* Lodd. Bot. Cab., t. 1033	„
M. confertum, Hort.=curvifolium, var. flexifolium, *N.E.Br.*	„
M. congestum, *Salm-Dyck*, Mes. §23, t. 2 ...	„
M. Cooperi, *Hook. f.* Bot. Mag., t. 6312 ...	„
M. cordifolium, *L.* Salm-Dyck, Mes. §61, t. 1	„
M. corniculatum, *L.* Salm-Dyck, Mes. §15, t. 6	„
M. crassulinum, *DC.* Salm-Dyck, Mes. §56, t. 3	„
M. cruciatum, *Haw.* Salm-Dyck, Mes. §7, t. 7	„
M. crystallinum, *L.*	„ and South Europe.
M. cultratum, *Salm-Dyck*, Mes. §8, t. 5 ...	South Africa.
M. curviflorum, Haw.=blandum.	
M. curvifolium, *Haw.* Salm-Dyck, Mes. §47, t. 2	„
M. „ var. album, *Hort.*	„
M. „ var. flexifolium, *N.E.Br.* ...	„
M. deltoides, *L.* Salm-Dyck, Mes. §30, t. 2 ...	„
M. depressum, *Haw.* Salm-Dyck, Mes. §8, t. 7	„
M. difforme, *Haw.* Salm-Dyck, Mes. §7, t. 3	„
M. digitiforme, *Haw.*	„
M. diminutum, *Haw.*	„
M. dolabriforme, *L.* Salm-Dyck, Mes. §6, t. 3	„
M. echinatum, *Ait.* Salm-Dyck, Mes. §53, t. 2	„
M. Ecklonis, *Salm-Dyck*, Mes. §49, t. 5 ...	„
M. edule, *L.*	„
M. elegans, *Jacq.*...	„

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M. falcatum, *L.* Salm-Dyck, Mes. §29, t. 2 ... South Africa.
M. falciforme, *Haw.* Salm-Dyck, Mes. §29, t. 1 „
M. flexifolium, Haw. *See* M. curvifolium.
M. formosum, *Haw.* Lodd. Bot. Cab. t. 1293 South Africa.
M. geminiflorum, *Haw.* Salm-Dyck, Mes. §17, t. 4 „
M. glaucum, *L.* Salm-Dyck, Mes. §25, t. 1 ... „
M. heteropetalum, *Haw.* Salm-Dyck, Mes. §21, t. 2 „
M. hispidum, *L.* Salm-Dyck, Mes. §51, t. 6... „
M. inclaudens, *Haw.* Bot. Mag. t. 1663 ... „
M. intonsum, *Haw.* Salm-Dyck, Mes. §52, t. 2 „
M. lacerum, *Haw.* Lodd. Bot. Cab. t. 1279 ... „
M. laeve, *Thunb.* „
M. Lehmanni, *E. & Z.* Salm-Dyck, Mes. §42, t. 1 „
M. Lepidum, *Haw* „
M. lineolatum, *Haw?* Salm-Dyck, Mes. §33, t. 7 „
M. linguiforme, *L.* Lodd. Bot. Cab., t. 1307 „
M. longispinulum, *Haw.* Salm-Dyck, Mes. §54, t. 4 „
M. longum, *Haw.* „
M. lupinum, *Haw.* Salm-Dyck, Mes. §5, t. 3 „
M. macrorhizum, *Haw.* Salm-Dyck, Mes. §49, t. 3 „
M. Mahoni, *N.E.Br.* Rhodesia.
M. maximum, *Haw.* Bot. Reg. t. 358 ... South Africa
M. minutum, *Haw.* Bot. Mag., t. 1376 ... „
M. multiceps, *Salm-Dyck?* Salm-Dyck, Mes. §6, t. 2 „
M. multiflorum, *Haw.* Salm-Dyck, Mes. §37, t. 1 „
M. multiradiatum, *Jacq.* „
M. muricatum, *Haw.* Salm-Dyck, Mes. §30, t. 3 „
M. mutabile, *Haw.* Salm-Dyck, Mes. §21, t. 3 „
M. noctiflorum, *L.* Lodd. Bot. Cab., t. 495 ... „
M. „ var. fulvum. *Salm-Dyck*, Mes. §43, t. 2 „
M. nuciforme, *Haw* „
M. obconellum, *Haw.* Salm-Dyck, Mes. §1, t. 3 „
M. perfoliatum, *Haw.* Salm-Dyck, Mes. §33, t. 1 „
M. polyanthon, *Haw.* Lodd. Bot. Cab. t. 1281 „
„ var. elegans, *Hort.* „

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M. pomeridianum, *L.* Bot. Mag., t. 540 ...	South Africa.
M. productum, *Haw.* Salm-Dyck, Mes. §40, t. 4	„
M. pulchellum, *Haw.* Salm-Dyck, Mes. §34, t. 1	„
M. pustulatum, *Haw.* Salm-Dyck, Mes. §8, t. 10	„
M. pyropeum, *Haw.* Salm-Dyck, Mes. §59, t. 1	„
M. quadrifidum, *Haw.*	„
M. racemosum, *N.E.Br.*	„
M. rhomboideum, *Salm-Dyck*, Mes. §6, t. 5 ...	„
M. rigidicaule, *Haw.* Salm-Dyck, Mes. §17, t. 2	„
M. rigidum, *Haw.* Salm-Dyck, Mes. §36, t. 2	„
M. roseum, Willd., Salm-Dyck, Mes. §29, t. 4 = multiradiatum	„
M. rubricaule, *Haw.* Salm-Dyck, Mes. §20, t. 3.	„
M. Salmii, *Haw.* Salm-Dyck, Mes. §7, t. 8....	„
M. sarmentosum, *Haw.* Salm-Dyck, Mes. §17, t. 3	„
M. serrulatum, *Haw.* Salm-Dyck, Mes. §20, t. 2	„
M. spectabile, *Haw.* Bot. Mag., t. 396 ...	„
M. spiniforme, *Haw.* Salm-Dyck, Mes. §47, t. 1	„
M. spinosum, *L.* Salm-Dyck, Mes. §41, t. 1...	„
M. stelligerum, *Haw?* Salm-Dyck, Mes. §52, t. 4	„
M. subincanum, *Haw.* Salm-Dyck, Mes. §49, t. 4	„
M. sulcatum, *Hort.* Salm-Dyck, Mes. §44, t. 1	„
M. tenellum, *Haw.* Salm-Dyck, Mes. §36, t. 1	„
M. tenuifolium, *L.* Salm-Dyck, Mes. §46, t. 6	„
M. testiculare, *Ait.* Bot. Mag., t. 1573 ...	„
M. tigrinum, *Haw.* Bot. Reg., t. 260... ...	„
M. tricolor, *Willd.*	„
M. „ var. album.	„
M. truncatum, *Thunb?*	„
M. tuberosum, *L.* Salm-Dyck, Mes. §49, t. 2	„
M. tumidulum, *Haw.* Salm-Dyck Mes. §37, t. 3	„
M. turbinatum, *Jacq.*	„
M. uncatum, *Salm-Dyck*, Mes. §8, t. 6 ...	„
M. uncinatum, *Linn.* Salm-Dyck, Mes. §33, t. 3	„
M. veruculatum, *L.* Salm-Dyck, Mes. §39, t. 1	„
M. violaceum, *DC.* Salm-Dyck, Mes. §48, t. 3	„
M. virescens, *Haw.* Salm-Dyck, Mes. §19, t. 3	Australia.
M. vulpinum, *Haw.*	South Africa
M. Zeyheri, *Salm-Dyck*, Mes. §40, t. 5	„

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Presentations to Museums.—CRINELLINO STUFFING (*Posidonia Caulinii*, Koenig), *Naiadaceae*. In the Diplomatic and Consular Report on the Trade of Sicily for the year 1905, H.M. Vice-Consul at Catania reports that a factory employing 50 hands has been established at Crinellino to prepare bed-stuffing from this plant, the daily production being 5 tons. Another factory preparing the product also exists at Messina. In response to an application made through the Foreign Office, H.M. Consul at Palermo has obtained examples of the crude and prepared products for the Museum. These will be found in Room 7, Museum No. II.

MAIZE PRODUCTS (*Zea Mays*, L.), *Gramineae*. Dr. C. F. Millspaugh, Curator of the Department of Botany, Field Museum of Natural History, Chicago, has presented to the Museum a series of specimens illustrating the manufacture of Starch and Glucose from Maize. These have been placed in Room 8, Museum No. II.

VEGETABLE IVORY (*Sagus* [*Metroxylon*] *amicarum*, Wendl.), *Palmae*. Specimens of the ivory-like nuts of this palm, a native of the Pacific Islands, have been submitted by a correspondent for determination. They were purchased under the name of "Fossilized Apples" for the manufacture of ornamental articles. These nuts are exported from the Solomon Islands as Vegetable Ivory, and are known under this name and also under that of "Apple Nuts" in the commerce of this country. See *Kew Bulletin*, 1897, p. 417, and Case 51, Museum No. II.

BERG BASS (*Osyris abyssinica*, Hochst.), *Santalaceae*. Dried specimens of the leaves of this plant, described as a shrub and employed in tanning in various parts of South Africa, have recently been received at the Museum for determination. Hitherto this plant does not appear to have been considered of economic value, but an allied plant, viz., Cape Sumach (*Colpoon compressum*, Berg.), the leaves of which bear a close resemblance of those of this *Osyris*, are known to be employed locally for tanning. An article on Cape Sumach, giving analytical details, appeared in the *Kew Bulletin* for 1898, p. 18. See also Case 102, Museum No. I.

J. M. H.

Additions to the Herbarium during 1905.—Donations of specimen were made by about one hundred persons and institutions, and amounted to over 16,000 sheets. The specimens purchased amounted to nearly 7,000 sheets. The principal collections are enumerated below.

VARIOUS PARTS OF THE WORLD. *Presented*:—Orchidaceae and Asclepiadaceae from New Caledonia, South Africa and New Guinea, by Mr. R. Schlechter; Mosses and Erysiphaceae, by Mr. E. S. Salmon; Oidia, by Mr. P. Magnus.

Purchased:—Kneucker, "Gramineae Exsiccatae," lief. xvii.-xviii.; "Carices Exsiccatae," lief. xii.-xii*a*.

ARCTIC AND ANTARCTIC REGIONS. *Presented*:—Antarctic mosses, by Mr. J. Cardot; Melville Island, by Miss Louisa Dacres.

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EUROPE. *Presented*:—"Kryptogamae Exsiccatae," Cent. x.–xi., by the Imperial Natural History Museum, Vienna; "Hieraciotheca gallica et hispanica," fasc. xv.–xvi., by M. G. Gautier; British Algae, by Mr. A. D. Cotton; rare British plants, by Mr. C. E. Salmon.

Purchased:—Holmes, "Algae Britannicae," fasc. xi.; Rabenhorst, "Fungi Europaei," ser. II., Cent. xlv.; Briosi and Cavara, "I Funghi Parasitti," fasc. xvi.; Degen, "Gramina Hungarica," fasc. iv.–vi.; Enander, "Salices Scandinaviae Exsiccatae," fasc. i.; Dahlstedt, Scandinavian Hieracia, Cent. xvii.; Linton, British Hieracia, supplementary fasc.; Fiori, Béguinot and Pampanini, "Flora Italica Exsiccata," Cent. i.–ii.

ORIENT AND ATLANTIC ISLANDS. *Presented*:—Canary Islands, by Mr. T. J. Dinn.

Purchased:—Bornmüller, "Iter Persicum alterum, 1902," continuation.

EASTERN AND CENTRAL ASIA. *Presented*:—Eastern Asia, by the Natural History Museum, Paris; Tibet and Chumbi, by the Botanic Gardens, Calcutta; Lhasa, by Lt.-Col. L. A. Waddell, C.I.E.; Wilson, Szechuan, by Messrs. J. Veitch & Sons; Western Szechuan, by Consul-General A. Hosie; Manberg, Yunnan, by Mr. A. K. Bulley; Hong Kong. by Mr. S. T. Dunn; Faurie, Formosan mosses, by Mr. J. Cardot.

Purchased:—Takeda, Japan, Cent. iii.–iv.

INDIA. *Presented*:—Nepenthes, by the Botanic Gardens, Calcutta; Burkill, Burmese freshwater algae, by the Botanic Gardens, Calcutta; Fungi, by Dr. E. J. Butler; British Bhutan Mosses, by Mr. J. S. Gamble, C.I.E.; Gollan, North-West Indian Mosses and Hepaticae, by Mr. J. R. Drummond; West Himalayan mosses, by Mr. J. F. Duthie; Monochlamydeae and Monocotyledons, by Sir D. Brandis, K.C.I.E.; rare Bombay plants, by Dr. T. Cooke, C.I.E.; Travancore, by Mr. T. F. Bourdillon.

MALAY PENINSULA AND ARCHIPELAGO. *Presented*:—By the Botanic Gardens, Singapore; Micholitz, Annam and Sumatra orchids, by Messrs. Sander & Sons; Copeland, Mindanao, by the Bureau of Science, Manila; Philippine Cyperaceae and Acanthaceae, by the Bureau of Science, Manila; "Plantae Bogorienses Exsiccatae," fasc. i., by the Botanic Gardens, Buitenzorg; New Guinea, by Mr. C. G. Seligmann.

Purchased:—Dr. C. C. Hosseus, Siam.

AUSTRALASIA. *Presented*:—New South Wales, by Mr. R. T. Baker; a complete series of his new species of Eucalyptus, by Mr. R. T. Baker; New South Wales Mosses, by Rev. W. W. Watts; Fiji and New South Wales Ferns, by Mr. H. N. Joynt; New Zealand and Rarotonga Hepaticae, by Mr. T. W. N. Beckett; New Zealand Ferns, by Miss L. M. Coombe.

TROPICAL AFRICA. *Presented*:—Liberia, by the Botanic Garden, Berlin; do., by Mr. H. Reynolds; Gold Coast, by Mr. W. H. Johnson; Lagos, by Mr. E. W. Foster; Cross River Division, Southern Nigeria, by Mr. N. C. McLeod; Gossweiler, Angola, by the University of Coimbra, through Dr. J. A. Henriques;

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Bahr-el-Ghazal, by Mr. Harold Brown; Sudan, by Mr. A. F. Broun; Drake-Brockman, Somaliland Grasses, by the Colonial Office; Dawe and E. Brown, Uganda, by Mr. M. T. Dawe; Bagshawe, Uganda, by Lieut.-Col. C. Delmé-Radcliffe; Uganda, and Aberdare Mountains, British East Africa, by Sir H. E. M. James, K.C.I.E., C.S.I.; British East Africa, by Mr. C. F. Elliott; do., by Mr. Andrew Linton; Usagara Ferns and Mosses, by the Rev. A. North-Wood; British Central Africa, by Mr. K. J. Cameron; Allen, Victoria Falls, by Sir C. Metcalfe, Bart.; do., by Mr. C. E. F. Allen; Gardner, Buluwayo, by Mr. M. Barthelemy; Ascension Island Cryptogams, by Mr. R. N. R. Brown.

Purchased:—Zenker, Cameroons.

MASCARENE ISLANDS. *Presented*:—Seychelles, by Mr. H. P. Thomasset; Madagascar, by the Rev. R. Baron.

SOUTH AFRICA. *Presented*:—By Dr. H. Bolus; R. Schlechter, South Africa, by Dr. H. Schinz; Port Elizabeth, by Miss Ethel West; Drakensberg, by Mr. E. E. Galpin; Orange River Colony, by Mr. H. J. Sankey; Transvaal, by Mr. J. Burtt-Davy; Miss A. Pegler, Transkei Asclepiadaceae, by Prof. P. MacOwan; Stapelieae, by Mr. S. N. Pillans.

Purchased:—R. Schlechter, South Africa; Wilms, Cryptogams.

NORTH AMERICA. *Presented*:—Chidley Peninsula, Labrador, by Sir W. MacGregor, K.C.M.G., C.B.; Canada, by the Geological Survey of Canada; Northern and North-Western Montana, by the New York Botanic Garden; various North American collections, including a set of Glatfelter's Salices, by the United States National Museum; Florida, by Mr. Oakes Ames; do., by the New York Botanic Garden; Grasses, by the United States Department of Agriculture; Sarracenias of the Southern United States, by Dr. J. M. Macfarlane.

Purchased:—Collins, Eastern Quebec; Heller, California; C. F. Baker, West Coast, North America.

CENTRAL AMERICA. *Presented*:—British Honduras, by Mr. E. J. F. Campbell; Mexico, by Mr. C. G. Pringle.

Purchased:—Palmer, Mexico; Pringle, Mexico.

WEST INDIES. *Presented*:—Bahamas, by the New York Botanic Garden; Windward Coast of Dominica, by Miss E. M. Bryant.

Purchased:—Curtiss, Cuba.

TROPICAL SOUTH AMERICA. *Presented*:—British Guiana, by the Botanic Garden, Georgetown; Brazilian Ferns, by Dr. C. Lindman.

Purchased:—Ule, Amazons; Hassler, Paraguay; Fiebrig, Paraguay.

TEMPERATE SOUTH AMERICA. *Presented*:—Chubut Territory, Argentine Republic, by Mr. C. Thursby; Buchtien, Chili, by the late Mr. C. B. Clarke.

The largest contribution received was the first set of E. H. Wilson's Szechuan plants, collected during his second journey in China for Messrs. James Veitch & Sons, by whom the set was

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presented. The collection comprised about 2,500 numbers, and included a special series of plants from Mount Omi. Descriptions of over thirty of the more obvious novelties contained in Wilson's two collections have already appeared (*Kew Bull.*, 1906, pp. 147–163).

A valuable set of about 1,200 plants from Chumbi and Tibet was presented by the Royal Botanic Garden, Calcutta. Many of the specimens were obtained in Chumbi and Phari by Lepcha collectors working under the supervision of Sir George King, late Superintendent of the Calcutta Garden. One of these collectors, named Dungboo, was able to penetrate as far as Lhasa and to bring back a small but interesting collection made *en route* to that city. Another very interesting collection, though of small extent and composed of rather fragmentary specimens, was made at the instigation of Sir Alfred Croft, late Director of Public Instruction, Bengal, by the Lama Ujyen Gyatsko, who went by way of Chumbi and Phari to Shigatze, returning to British Sikkim by way of Nepal. The rest of the collection was obtained during the course of the negotiations of the recent Tibet Mission. While this mission was at Khambajong in 1903, Sir F. E. Younghusband supervised native collectors belonging to the Calcutta Garden in Khamba and the Lonok. In September, 1903, the Director of the Botanical Survey of India was himself able, at the invitation of Sir F. Younghusband, to visit the mission at Khambajong in Southern Tibet. Though it was then almost too late in the season for more than the collection of seeds, the Director was able, with Sir F. Younghusband's assistance, to make satisfactory arrangements for the collection of specimens during 1904 by means of native collectors who worked immediately under Captain Walton, I.M.S., Surgeon to the Mission Staff. Much help was also given to these collectors by Mr. E. H. Walsh, I.C.S., Political Officer in Chumbi, Mr. C. White, C.I.E., Political Agent in Sikkim, and Major C. H. D. Ryder, R.E., D.S.O., the Survey Officer attached to the mission.

An unusually large number of Tropical and South African collections was presented during the year, the most noteworthy being Gossweiler's Angola and Dawe's and Brown's Uganda collections. A set of Gossweiler's Angola collection, numbering about 1,200 sheets, was presented by the University of Coimbra, through Professor J. A. Henriques. Mr. Gossweiler collected in the districts of Loanda, Malange and Cazengo, and his collection, apart from the novelties it contains, will be of great value in supplementing the Kew material of many Welwitschian species.

The Uganda collections formed and presented by Messrs. M. T. Dawe and E. Brown comprised about 1,150 sheets. A complete list of Dawe's plants is contained in his "Report on a Botanical Mission through the Forest Districts of Buddu and the Western and Nile Provinces of the Uganda Protectorate," issued as a Parliamentary Paper in April, 1906. His collections contained about 50 new species and one new genus, of which descriptions will appear in a forthcoming number of the Journal of the Linnean Society (Botany). Brown's collections are mainly from the neighbourhood of Entebbe, and show that the flora of that district is by no means yet completely known.

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About 1,100 sheets of Hassler's Paraguay plants were acquired by purchase. They consist of Dr. Hassler's collections for the years 1903–5, and include a set collected by T. Rojas in the Northern Chaco of Paraguay, a little-known district.

Another large American collection was the concluding instalments of his Amazons plants, purchased from Dr. E. Ule. It included over 1,000 sheets, of which 400 were Cellular Cryptogams, and the remainder Phanerogams and Vascular Cryptogams.

A valuable contribution received from Mr. R. T. Baker, Curator of the Technological Museum, Sydney, was a complete set of the new species of Eucalyptus, described by him and investigated in Baker and Smith, "A Research on the Eucalypts, especially in regard to their Essential Oils" (Sydney, 1902).

The first fascicle of his "Salices Scandinaviae" was purchased from Mr. S. J. Enander. It contains 150 specimens and photographs, belonging to 50 species, varieties and forms, a very large proportion of which are hybrids. The beautiful photographic reproductions of unique or rare specimens form a noteworthy feature of the series.

Discovery of Goodyera repens in Norfolk.—The Rev. Guy Halliday, of Bowhill, Bradninch, Devon, recently sent to Kew a specimen of an orchid which he had collected near Holt, in North Norfolk, requesting its name. It proved to be *Goodyera repens*, and, in response to our request, he communicated the following particulars. Cycling to Holt, and botanizing by the way, he and his wife came to a pond with a pine-wood and heather adjoining. They strayed some hundred yards into the wood and had turned to go back when Mr. Halliday's eye fell upon an orchid. This was carelessly pulled up under the impression that it was *Spiranthes autumnalis*, and a hasty search was made for more, but unsuccessfully. Subsequent examination convinced him that it was not a *Spiranthes*; he thought it must be *Goodyera*, and to make sure he sent it to Kew.

Until 1885 there was no convincing record of an English station for this plant, but in Baker's *Flora of the Lake District* it is recorded, on the authority of Dr. F. A. Lees, from a fir plantation between Penrith and Carlisle. In 1888, Mr. J. J. Marshall (*Journ. Bot.*, p. 379) recorded the discovery of several plants in Houghton Wood, near Market Weighton, S.E. Yorkshire. Now comes this one from Holt. The question arises, how did the *Goodyera* reach these modern pine-woods? This suggests another question, were the young pines brought from the forests of Scotland and seeds or roots of the *Goodyera* with them? Possibly seed may have been conveyed by birds, or intentionally sown by man. Whatever the history may be, it is almost certain that the *Goodyera* did not exist in these southern localities before the pines were planted. A similar isolated locality for this plant was pointed out to Mr. Bean by Mr. Maurice de Vilmorin, at Les Barres. This is also in a young pine-wood.

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Goodyera repens is one of the most widely distributed of orchids, occurring all round the northern hemisphere. The specimen from Norfolk has been deposited in the Kew Herbarium on indefinite loan.

W. B. H.

Presentations to the Library during 1905.—The Bentham Trustees have presented the following:—*Bartholomaeus Anglicus, De proprietatibus rerum*, 1535, which, excepting *The Great Herbal* of 1526, is the earliest book in the English language at Kew; *Dioscorides, Codex Anicias Julianae picturis illustratus*, 1905, a reproduction in facsimile of the famous Dioscoridian Codex preserved in the Imperial Library at Vienna (see *Kew Bull.*, 1905, p. 70); *Hill, Decade di alberi curiosi ed eleganti piante delle Indie orientali*, etc., 1786; *Parkinson, Paradisi in sole*, the first edition, 1629; *Thomé, Flora von Deutschland*, etc., 1886–89, 4 vols.; *Urzedow, Herbarz polski*, 1595, a herbal printed in Polish and published at Cracow; *Vallet, Le jardin du roy très chrestien Henry IV. roy de France et de Navare*, 1608; *Herbert, Some years travels into divers parts of Africa and Asia the Great*, ed. 3, 1677; *Heuglin, Reise in das Gebiet des Weissen Nil . . . in den Jahren 1862–64*, 1869; *Lenz, Timbuktu*, 1892, 2 vols.; *Schlagintweit-Sakuenluenski, Reisen in Indien und Hochasien . . . in den Jahren 1854–58*, 1869–80, 4 vols.; *Sievers, Asien*, 1893; also the continuation of about 20 periodicals. Sir W. T. Thiselton-Dyer, K.C.M.G., presented a large number of selected tracts from his own library, and the following:—*Berge, Pflanzenphysiognomie*, 1880; *Bettany, First lessons in practical Botany*, 1881; *Massee, European Fungus Flora, Agaricaceae*, 1902; *The life and letters of G. J. Romanes*, 1896; and *W. G. Smith, Diseases of field and garden crops, chiefly such as are caused by Fungi*, 1884. The President of the Carnegie Institute of Washington presented a copy of Conard's fine work on the genus *Nymphaea*, 1905, and *Macdougal*, etc., *Mutants and hybrids of the Oenotheras*, 1905. *Ashe, Some new species of the genus Crataegus*, etc., 1900, and *North American Flora*, vol. xxii., parts 1 and 2, 1905, were received from the Director-in-Chief of the New York Botanical Garden; *Berger, Florula mortolensis*, 1905, from Sir Thomas Hanbury, K.C.V.O.; a long series of articles on Vegetable Pathology and Mycology by Berkeley, published in the *Gardeners' Chronicle*, from Mr. J. B. Carruthers; *De Wildeman, Mission E. Laurent, énumération des plantes récoltées . . . pendant sa dernière mission au Congo*, fasc. 1 and 2, 1905, from the Secrétaire Général du Département des Finances de l'État Indépendant du Congo; *Fries, Zur Kenntnis der alpinen Flora im nordlichen Argentinien*, 1905, and *Haglund, Ur de högnordiska vedväxternas ekologi*, 1905, from the Director of the Botanic Garden, Upsala; *Freeman, Minnesota Plant Diseases*, 1905, from the Regents of the University of Minneapolis and the author; *Hare, Caspari, Rusby*, etc., *The National Standard Dispensatory*, 1905, from Messrs. Lea Bros. & Co.; *MacMahon, The merchantable Timbers of Queensland*, 1905, from the Secretary, Department of Agriculture and Stock, Brisbane; *Webbia, raccolta di scritti botanici . . . edita da U. Martelli*, 1905, from the editor; *Massee and Crossland, The Fungus Flora of Yorkshire*, from Mr. Geo. Massee; *Merrill,*

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A review of the identifications of the species described in Blanco's Flora de Filipinas, 1905, and other publications of the Bureau of Government Laboratories of the Philippine Islands, from the Superintendent of Government Laboratories; *Monteverde, A guide to the museum of the Imperial Botanic Garden, St. Petersburg*, 1902, from Mr. V. J. Lipsky; *Naegeli and Thellung, Die Flora des Kantons Zürich*, Teil 1, 1905, from Dr. Hans Schinz, who has also presented his *Plantae menyharthianae*, 1905, and the *Flora der Schweiz*, zweite Auflage, Teil 1, 1905, by himself and R. Keller; *Oudemans, Catalogue raisonné des Champignons des Pays-Bas*, 1905, from the Academy of Sciences, Amsterdam; *Ritsema and Sack, Index phytochemicus*, 1905, from Dr. M. Greshoff; *Roessig, Die Rosen nach der Natur gezeichnet und colorirt*, [1802–20], a rare work, from Mr. W. E. Gumbleton; *J. J. Smith, Die Orchideen von Java*, from the Director of the Department of Agriculture, Buitenzorg; *Yonge, An English-Greek Lexicon*, ed. 4, 1861, from Mr. C. B. Clarke; *Hosie, Report on the province of Ssuch'uan*, 1904, and *Report on a journey to the eastern frontier of Thibet*, 1905, from the Controller of H.M. Stationery Office; *Kidder and Fletcher, Brazil and the Brazilians*, 1857, from Mr. Geo. Nicholson; *Bollettino della Arboricoltura italiana*, anno 1, 1905, from Dr. L. Savastano; *Memoirs of the [Royal] Caledonian Horticultural Society*, vol. iv., part 1, 1827, and new series, vol. i., part 1, 1905, from the Secretary, Mr. P. Murray Thomson; *Pammel, Ball and Lamson-Scribner, The Grasses of Iowa*, part 2, 1904, from Prof. L. H. Pammel; *Journal of the Federated Malay States Museums*, vol. i., Nos. 1 and 2, 1905, from the Curator of the Perak State Museum; *Collected Papers of the Lister Institute of Preventive Medicine*, No. 1, 1904, from the Secretary; *Annual Reports of the Michigan Academy of Science*, from the Librarian; *Bulletins of the Divisions of Biology and Horticulture, New Zealand Department of Agriculture*, from Mr. T. W. Kirk; *Report of the Transvaal Department of Agriculture*, 1903–04, from the Director of Agriculture; *Moniteur du Jardin botanique de Tiflis*, livraison 1, 1905, from the Director; *Smithsonian Miscellaneous Collections*, vols. xlvi. and xlvii., 1904–05, from the Secretary of the Smithsonion Institution. The following have been presented by their respective authors:—*F. M. Bailey, The Queensland Flora, General Index*, 1905; *H. Bolus, Sketch of the floral regions of South Africa*, 1905; *A. Chevalier, Les végétaux utiles de l'Afrique tropicale française*, vol. i., fasc. 1, 1905; *E. De Wildeman, Notices sur des plantes utiles ou intéressantes de la Flore du Congo*, fasc. 2 and 3, 1904–05; *L. Diels, Beiträge zur Flora des Tsin ling shan*, etc., 1905; *L. Diels and E. Pritzel, Fragmenta phytographiae Australiae occidentalis*, 1905; *W. G. Farlow, Bibliographical index of North American Fungi*, vol. i., part 1, 1905; *E. C. Jeffrey, The comparative anatomy and phylogeny of the Coniferales*, part 2, 1905; *E. C. Jellett, Germantown old and new*, 1904; *V. J. Lipsky, Flora Asiae mediae*, 1–3, 1902–05, and other works; *J. P. Lotsy, Vorlesungen über Deszendenztheorien*, etc., Erster Teil, 1905; *J. Matsumura, Index plantarum japonicarum*, vols. i., and ii., pars. 1, 1904–05; *C. H. Peck, Mushrooms and their use*, 1897; *E. A. Petherick, Catalogue of the York Gate Library formed by Mr. S. W. Silver*, ed. 2, 1866 (received through the kind offices of Mr. O. Omash); *W. L. Rutton, The*

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Royal Residences at Kew, 1905 (from the *Home Counties Magazine*); *C. S. Sargent, Manual of the Trees of North America*, 1905; *T. R. Sim, Tree-planting in Natal*, 1905; *J. W. H. Trail, The Flora of Buchan*, 1904; *A. H. Unwin, Future Forest Trees*, 1905; *M. L. de Vilmorin and D. Bois, Fruticetum Vilmorinianum*, 1904; *F. N. Williams, Liste des Plantes connues du Siam*, 1904–05; *H. Wright, Hevea brasiliensis or Pará Rubber*, 1905; *A. Negreiros, Le Mozambique*, 1904. The continuation of several periodicals have been presented, as in former years, by Sir J. D. Hooker, G.C.S.I. The manuscripts presented include the *Journal of Sir J. Banks on Captain Cook's first voyage round the world*, 3 vols., from Mr. R. H. Hooker; this is a transcript of the copy made of the original MSS. for Mr. Dawson Turner; *Notes on fruit-trees, Correspondence*, and *Observations and remarks on the diseases of fruit- and forest-trees*, altogether 5 volumes, by W. Forsyth, from Mrs. Cochran; *E. Madden's Itineraries, Notes on Plants*, and *Miscellaneous notes*, 3 volumes, from the Regius Keeper, Royal Botanic Gardens, Edinburgh.

Botanical Magazine for August.—The plants figured are *Rhodostachys pitcairniifolia*, Benth., *Bulbophyllum Ericssoni*, Kränzl., *Boronia fastigiata*, Bartl., *Codonopsis Tangshen*, Oliv., and *Hedysarum multijugum*, Maxim., var. *apiculatum*, Sprague. The *Rhodostachys* is a handsome Bromeliaceous plant from Chili, with the upper leaves, which surround the head of pale blue flowers, bright red on the upper surface of the basal part. The specimen figured flowered in the collection of Major W. L. Harvey at Tredarvah, Penzance. The Kew plants, of which there are several, have not flowered during the last ten or fifteen years. *Bulbophyllum Ericssoni* is a native of the Malay Archipelago and was figured from a plant which flowered in the garden of Sir Trevor Lawrence, Bart., in 1899. Its flowers are large, green, spotted with purple-brown, and have long-acuminate sepals and petals. The *Boronia* is a pretty greenhouse plant from Western Australia, whence it was first introduced into the St. Petersburg Botanic Garden half a century ago. It has been grown at Kew under the erroneous name of *B. polygalifolia*. The figure was prepared from a plant raised from seed communicated by the Director of the Sydney Botanic Garden in 1899. *Codonopsis Tangshen* is an interesting Chinese drug-yielding plant belonging to the Campanulacae. About 1,200,000 lbs. of the drug, known to the natives as "T'ang-shên" and valued on account of its tonic properties, is annually exported from Hankow to other parts of China. The specimen figured and the plant growing in the Rockery at Kew were received from Messrs. James Veitch & Sons. The beautiful *Hedysarum* has been grown at Kew for many years, and a particularly fine bed of it may be seen near the Refreshment Pavilion, flowering in June and July. The variety is described for the first time.

Irish Gardens.—In the account of the various gardens in Ireland described in Article XXXVII. (p. 219 *et seq.*, of this volume) it is inadvertently stated that Darreen (p. 222) and Rossdohan (p. 223) are situated on Galway Bay. They are situated on the Kenmare River.

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ROYAL BOTANIC GARDENS, KEW.

BULLETIN

OF

MISCELLANEOUS INFORMATION.

No. 8.] [1906.

XLVI.—THE OIL-GRASSES OF INDIA AND CEYLON.

(*Cymbopogon*, *Vetiveria* and *Andropogon* spp.)

(With Plate.)

OTTO STAPF.

About eight years ago the firm Schimmel & Co. (Fritzsche Bros.), of Leipzig, manufacturers of volatile oils, commissioned Messrs. E. Gildemeister, of Leipzig, and Fr. Hoffmann, of Berlin, with the preparation of a treatise on the entire subject of volatile oils. The result was a volume of over 900 pages (with maps and numerous illustrations) which, under the title "*Die ätherischen Öle*," was published by Julius Springer, of Berlin, in 1899. In the following year it appeared in a slightly condensed edition (*The Volatile Oils*, 732 pages), translated by Edw. Kremers, of Madison, Wisconsin, and published by the Pharmaceutical Review Publishing Co., of Milwaukee. The work is a remarkable and unfortunately all too rare instance of co-operation between practical and scientific men. In plan and execution it gives striking proof of the farsightedness and liberality of the manufacturers, who wished to see their business placed on a scientific basis, and at the same time of the thoroughness of the experts who were invited to carry out the ideas of their commissioners. The part dealing with the "Oils of the Gramineae" occupies pp. 280–300 of the "Special Part." Those oils—there are seven of them—are first treated generally in an introductory paragraph and then individually with respect to origin, preparation, composition, properties, production, and commerce. They are:—

1. Palmarosa Oil from *Andropogon Schoenanthus*, L.
2. Ginger-grass Oil, described as inferior Palmarosa, or a mixture of the latter with turpentine or mineral oil.
3. Lemon-grass Oil from *Andropogon citratus*, DC.
4. Vetiver Oil from *Andropogon muricatus*, Retz.
5. Citronella Oil from *Andropogon Nardus*, L.
6. Oil of *Andropogon odoratus*, Lisb.
7. Camel-grass Oil from *Andropogon laniger*, Desf.

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The botany of the oil-grasses is only slightly touched upon in the work. The definitions and the nomenclature of the species are, on the whole, those of Hackel's monograph of *Andropogoneae* and of Hooker's elaboration of the grasses of India. The origin of the several oils from the species mentioned is stated somewhat apodictically, and there is nothing to suggest the difficulties which from time to time have arisen owing to the unsatisfactory state of our knowledge of the "botany" of those grass-oils. This condition has become more accentuated with the increased interest in the grass-oil industry during the last few years and with the attempts at reorganising and extending it in its old homes and at introducing it into other tropical countries. The 'Semi-Annual Reports' published by Schimmel & Co. contain not a few direct and indirect references to the uncertainty of the taxonomy of the grasses involved: I quote only two passages.

In the April–May Report for 1903, p. 23, the authors say:—"It has repeatedly attracted our attention, that when it is a question of their origin, the Andropogon grasses are frequently confounded with each other . . . there are some exactly defined species indicated as the mother plants of oils which, according to our information, could not possibly be produced from them"; and again in the October–November Report for 1905, p. 52: "On a previous occasion we have already pointed out that the Andropogon grasses, where their origin is mentioned, are frequently mistaken one for the other. This inconvenience is all the more felt as the uncertainty of the botanical nomenclature also exists in scientific work."

At Kew the experience has been the same. The incongruous application of the names '*Andropogon Schoenanthus*' and 'Lemon-grass' and the obscurity of De Candolle's *Andropogon citratus* have been among the principal sources of trouble. To them has had to be added, more recently, uncertainty as to the origin of the Ginger-grass oil. Even the comparatively well-known Citronella grass has been suspected to be a "composite" species, or at any rate to include two varieties, the distinctive morphological characters of which were still to seek.

Under the circumstances a thorough overhauling, from the taxonomic standpoint, of the grasses involved was essential in the interests of the grass-oil industry. Having been entrusted with this task, I revised in the first place the material in the Kew Herbarium. Rich as it was in some respects, it was sadly lacking in others. A fine collection of oil-grasses made in Southern India at the instigation of Mr. C. A. Barber, Government Botanist at Madras, went a long way to fill the gaps, so far as the Madras Presidency and Travancore were concerned, whilst Dr. Lotsy, of the Rijk's Herbarium at Leiden, and Dr. Treub, of Buitenzorg, supplied useful material from Java. Convinced that no scientific problem should be approached without due consideration of its historical development, I have endeavoured to get a good grasp of the history of the subject. This has entailed a great deal of library work and search for original specimens, as documentary evidence, in the older herbaria. Professor Urban of Berlin, Professor Mattirolo of Turin, and Dr. Briquet of Geneva, have assisted in this direction by the loan of specimens; but the

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greatest help has come from the collections in the British Museum and in Hanbury's Herbarium at the Pharmaceutical Society of Great Britain. The Council of the latter Society have placed me under a special obligation by sending the whole of the *Andropogoneae* of that valuable collection to Kew in order that I might study it at leisure. For this liberal and courteous assistance I wish to express my sincere gratitude to all concerned.

In this paper I have endeavoured to embody the results of my researches into the history and taxonomic position of the oil-grasses of India and to introduce the necessary changes in their nomenclature. I hope to have laid the foundation for a more satisfactory conception of those grasses as taxonomic units. At the same time I am well aware of the incompleteness of my work and the inevitable defects of research carried on to a great extent with material which has been collected casually or at least without consideration for the requirements of the problem as it presents itself to-day. Moreover, certain questions, some of them of great theoretical and practical importance, can, at the herbarium table, only be approached by a method of inference. The conclusions arrived at in this way will carry more or less weight according to the number and precision of the data which the specimens present. I have in view more particularly the question of "variability" on which so much depends for the correct co-ordination and subordination of forms. The notes we have on this point from collectors and others who have had opportunities of observing the oil-grasses in their natural stations or in cultivation are few and extremely meagre. Systematically conducted experiments there are none. When this is the case the taxonomist has generally to fall back on his 'tact'; but valuable as this somewhat ill-definable quality in certain circumstances may be, conclusions based on it cannot be accepted as final so long as they have not been confirmed by extended and direct observation in the field and by experiment. Work of this kind must therefore necessarily be more or less incomplete and preliminary. Nevertheless, it is a *conditio sine quâ non* for systematically conducted field-work and experiment. It provides field-workers with a starting basis and with the means of checking the identity of the plants under observation. In return it will no doubt one day receive its corrective from that quarter. In discriminating and defining the species which are here under consideration I have so far relied on external characters. They might, and certainly will, in the future be supplemented by anatomical characters. I have not carried my investigations in this direction far enough for publication, but sufficiently far to see that they promise especially the possibility of greater precision in the description of some of the external characters. For naming purposes the anatomical characters will hardly be required in cases where complete material is at hand; but they may be of value where, for instance, as is sometimes the case, barren plants have to be determined.

How far they may influence the classification of the oil-grasses it is premature to say; but I would quote Hackel's* observation on the taxonomic value of anatomical characters in *Andropogoneae*

* Andropogoneae in DC. Monogr. Phaner., vol. vi., p. 17.

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generally. Having examined the leaf-structure of more than one fourth of all the *Andropogoneae* described in his monograph to see how far the anatomical characters coincide with the morphological and can be used for the definition of the natural groups, he says : "*The result is absolutely negative.* Neither is it possible to distinguish anatomically the *Andropogoneae* from the allied tribes or even the remote tribe of *Chlorideae*, nor is there any one character or combination of characters which is confined to one genus. Even the sub-genera possess a uniform leaf-structure only in some cases when they comprise less than ten species. The species, however, are, with the exception of such as are very polymorphous, mostly well characterised by their anatomy." It must, however, be remarked that the leaf is probably more plastic than any other organ in grasses and might therefore *a priori* be expected to exhibit the phenomena of epharmosis in a prominent degree. The study of the anatomy of the glumes and fruits would possibly yield a different result. However this may be, an investigation into the anatomy of the oil-grasses, and particularly into the development and distribution of the oil cells, is highly desirable. With the exception of a very valuable description of the oil cells of "*Andropogon Schoenanthus*" by Professor F. von Höhnel,* nothing is known in this direction. Yet it is quite obvious that to know the seat of the oil-yielding tissues, their properties, the time and conditions of their formation and the changes they subsequently undergo, must be of considerable importance for the rational development of the grass-oil industry, just as it is, from the standpoint of pure science, necessary for the complete understanding of the organisation of those grasses.

In so far as organisation means correlation of structure and function, new problems await us on that ground, but they are problems for the physiologist. Some are of a general nature, as the question of the genesis of the grass-oils and the place of these in the economy of the plants which produce them; others are more directly connected with the practical side of the subject, such as the problems of the changes in the yield of oil according to the season, its reduction in old plants, the variation in the chemical constitution of the oils in morphologically indistinguishable races, and the apparently capricious limitation of some forms, particularly suitable for industrial exploitation, to certain geographical areas. Remote as the relations of physiology to the taxonomy of the oil-grasses may appear to be, there is one problem which touches the latter directly. This is the question of purely physiological races : how far they actually exist, what they are, and what place they ought to be given in the 'system.' Other physiological problems are intimately connected with 'variability,' and so have a distinct bearing on taxonomy. Beyond this it is at present probably impossible to indicate in detail the help which in this, as in similar

* F. von Höhnel, in Sitz. Ber. Akad. Wissensch. Wien, Mathem-Naturhist. Cl., vol. lxxxix., part. i. (1884), pp. 14, 15.—I have put the name *Andropogon Schoenanthus* between inverted commas because the author obviously intended to deal with the anatomy of the grass yielding the Palmarosa oil, viz., the *Andropogon Schoenanthus* of most Indian botanists, whilst he actually described the structure of the original Linnaean *Andropogon Schoenanthus* or the *A. laniger* of Desfontaines. Such are the pitfalls of a confused nomenclature.

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cases, the taxonomist may expect from the physiologist. But there will always be that general and fundamental relation which results from the rational conception of the ultimate task of the taxonomist, namely, to classify, not the dry and dead specimens of a herbarium, but through them the infinite diversity of forms in which plant life manifests itself.

In making these observations I may seem to have gone somewhat out of my way; but I shall perhaps be pardoned if I say that it appeared to me useful to show, in a case which is typical of the possibilities of applied botany, what the term 'botany' really means; to fix within its compass the position, the claims and the limits of taxonomy, and to emphasize the interdependence that exists between taxonomy, anatomy and physiology.

I have to add only one other observation in this place; it concerns the limitation of the genus *Andropogon*. Hackel's* definition is well known. It is wide enough to take in, not only the *Andropogon* of Bentham and Hooker's 'Genera Plantarum,' but also their *Heteropogon*, *Chrysopogon* and *Sorghum*. Hackel enumerates 193 species. This was in 1889; since then over 100 species have been added. But the genus is not only large, it is very heterogeneous. The author himself leaves no doubt as to that. He divides it into 13 subgenera, most of them very homogeneous groups. Their affinities are, however, admittedly† such, that some of them exhibit much closer relations to genera left outside the genus *Andropogon* than to the other congeneric subgenera. The result is a lack of symmetry in his system which is not only felt by the theoretical taxonomist, but also by the practical worker who has to sort and name *Andropogoneae*. Reaction was unavoidable, and it has already set in. Rendle‡ in England, Britton and Brown§ in America, Husnot‖ in France, have, more or less, returned to Bentham's exposition of the genera of *Andropogoneae*, and Sir Joseph Hooker¶ has expressed himself in favour of a similar course, whilst Nash** has even gone a step farther and re-established *Schizachyrium* and *Vetiveria*. Although convinced of the desirability of some change in this direction I have so far hesitated to accept it on account of the great number of alterations in nomenclature thereby entailed and of the difficulty in deciding what should be left in *Andropogon*. The latter objection does not, however, affect the grasses with which I have to deal in this paper. The subgenera *Cymbopogon* and *Vetiveria*, to which 11 out of the 12 oil-grasses belong, are sufficiently distinct to be recognised as genera, whilst the position of the remaining species in the reduced genus *Andropogon* is, whatever its exact limits may be, equally well assured. This being so, and considering the general tendency towards the recognition of less bulky and more homogeneous genera, it is clear that the change is bound to come. I have therefore decided to introduce it myself on this occasion,

* Hackel, Andropogoneae in DC., Monogr. Phaner., vol. vi., p. 359.
† Hackel, l.c., pp. 360–361, and tab. 2.
‡ Rendle, in Cat. Afr. Pl. Welwitsch, vol. ii., p. 142.
§ Britton and Brown, Ill. Flora, Northern States and Canada, vol. i., p. 100.
‖ Husnot, Graminées de France, etc., pp. 15–17.
¶ Hooker, in Trimen, Fl. Ceylon, vol. iv., p. 227.
** Nash, in Small, Flora, South-East. United States, p. 60.

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the more so as other changes had to be made in any case. I am alluding to the circumscription of the species *Andropogon Nardus* and *A. Schoenanthus* of Hackel's monograph. They have become overloaded with subspecies and varieties just as the genus *Andropogon* has become overloaded with subgenera. Theoretically there is little or no objection to the subordination of those forms under a group of higher rank; but it appears to me inexpedient to introduce those theoretical conclusions into what I may call our everyday nomenclature, which should be short, plain and direct. The species as I have defined them are with few exceptions, geographically, morphologically, and as far as we can see at present, also physiologically tolerably well defined, and those which are in cultivation have proved remarkably constant.

The complexity of the historical and argumentative part of the matter has obliged me to extend the volume of the paper so much that it is desirable to divide it into two parts. In the first part I attempt to give a circumstantial account of the botanical and economical history of the oil-grasses. The second is more of the nature of a résumé with the addition of such data as either result directly from the conclusions arrived at (*e.g.*, most of the synonyms) or have been thought worth including as a further help in the identification of the oil-grasses (*e.g.*, the enumeration of herbarium specimens and vernaculars). I have not thought it necessary to describe the species at length, as descriptions already exist, although in several cases the describers have treated some of the grasses merely as varieties. It has seemed to me, however, useful to add an expanded key to the species. This contains all that is essential for naming purposes; references to more extensive descriptions may be found under the heading 'Descriptions.'

I.—BOTANICAL AND ECONOMICAL HISTORY OF THE OIL-GRASSES.

All the oil-yielding grasses of India belong to the tribe *Andropogoneae*, which is, on the whole, rich in more or less aromatic species. No attempt has been made to treat them comprehensively from that standpoint, and practically nothing is known of the nature and distribution of the oil-containing tissues and their functions. The oils themselves have been examined in a few instances and their chemical constitution and physical properties ascertained; but even in those cases a renewed examination is desirable as the botanical identification of the material examined is not always above suspicion.

The aromatic character of some of those grasses is so pronounced as to have attracted the attention of man at a very early period of his history. They found a place in the performance of religious rites, among domestic medicines, in the dispensaries of the medical practitioners, and in the department of spices and perfumes. The "Schoenanthus" of the Ancients, the "Viranam" of the Vedhas and the "Sereh" of the Malays are illustrative instances, and there is very little doubt that the much discussed κάλαμος ἀρωματικός of the Greek writers was a plant of the same category although we have not so far succeeded in fixing the

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species. With the discovery of more powerful or more pleasant aromata these oil-grasses gradually lost their importance or even fell out of use. But in our own day the highly perfected art of perfumery has seized on them again, has revived the taste for their odours and created that demand for their oils which has found its response in the development of a regular oil-grass industry in Ceylon, India, and to a less degree in the Malay Peninsula and in Java. Out of the 12 grasses treated here, only four are worked commercially; but there is no doubt that others are to be found, particularly among their African congeners, which might be equally serviceable and probably place new essential oils at the disposal of the manufacturers of perfumes and perfumed articles.

The genera to which those 12 species belong are *Cymbopogon* with 10, and *Vetiveria* and *Andropogon* with one species each. The following paragraphs contain an account of their history, botanical as well as economical.

1. Cymbopogon Schoenanthus, *Spreng.*

(*Andropogon Schoenanthus*, Linn., not of most authors.)
Camel-Hay—Izkhir (Arab.)—Khavi (Hind.).

"HERBA SCHOENANTHI," THE FOUNDATION OF THE SPECIES.—*Andropogon Schoenanthus* was established by Linnaeus in the first edition of his Species Plantarum, p. 1046, in 1753. As is so frequently the case, his diagnosis is utterly insufficient for identification. It consists of the specific phrase of the *Lagurus*, No. 465, of his Flora Zeylanica (1747). On the other hand, his references leave no doubt whatever that he meant the "*Herba Schoenanthi*" of the earlier herbalists and the pharmacopoeias of his time. He, moreover, states this expressly in his Materia Medica (1749), p. 31, where he also indicates Arabia as the native country of the species. In his Species Plantarum, it is true, he added "India" to the distribution area of *Andropogon Schoenanthus*. He cannot have known of the extension of this species into North-Western India; the reason for the addition must therefore be sought somewhere else. As this addition has led almost from the very beginning to great confusion, it appears necessary to examine the circumstances that may have guided Linnaeus. Was it the inclusion of the Ceylon *Lagurus* into the synonymy of the species, or did he possess specimens from India which he thought were identical with the Arabian "*Herba Schoenanthi*," the foundation of his species?

I take the case of the Flora Zeylanica first. There the passage concerned, and referred to above, is made up of diagnostic phrases of the "*Herba Schoenanthi*," of a citation from Burmann's 'Thesaurus Zeylanicus,' p. 107, and of another from Hermann's 'Museum Zeylanicum,' p. 66. Burmann himself, l.c., quotes Plukenet, Alm. p. 175, t. 190, f. 1, and Hermann. Neither Plukenet's text and figure, nor the original which is still preserved in his herbarium at the British Museum leave us in doubt as to his having the officinal "*Herba Schoenanthi*" in view. Concerning Hermann, however, this is what he says: "*Kalanduru*: Gramen Dactylon Zeylanicum radice tuberosa, aromatica, dulci, odorata." *Kalandura* is a name still in use in Ceylon, and applied to

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Cyperus rotundus, with which Hermann's description agrees. It is evident that the "*Herba Schoenanthi*" found its way into the Flora Zeylanica through Burmann's careless interpretation of Hermann's *Kalanduru*, and that Linnaeus was wrong if, indeed, his term "India" was meant for Ceylon.

The next question is, did Linnaeus possess specimens of *A. Schoenanthus* (in the sense of the "*Herba Schoenanthi*") or any other Indian specimens which he considered representative of his *A. Schoenanthus*? Munro* has stated that there are in Linnaeus's herbarium two specimens of "*A. laniger*" (that is "*Herba Schoenanthi*"), one in the cover containing *Avena*, the other placed with *Festuca* and written up as "*Nardus spuria Gangitis, Lob.*" In both cases he was mistaken. The specimen in the *Avena* cover is without any name or other note. When and whence Linnaeus got it, and even whether he himself placed it there, will probably never be known. In my opinion it is a sample of *A. marginatus*, Steud., from South Africa. The other sheet contains a couple of leaf-tufts, or rather their bases. They belong probably to *Ctenium americanum*, Spreng., an aromatic grass which was figured and described by Parkinson† first (p. 115), as "Nardus gangitis spuria Narbonensis," and then (p. 1688) as "Nardo gangiti spuriae Narbonensi similis planta Virginiana." But Munro‡ also pointed out that there was a specimen of "*A. Schoenanthus*, L." in the Linnaean herbarium, and he says of it: "*A. Schoenanthus*, L. From India and Arabia. This is the plant generally called '*A. Martini*,' Roxb., '*A. pachnodes*,' Trin., and many other names. It is quite distinct from Wallich's *A. Schoenanthus*. Linnaeus's specimen is remarkably well figured by Ventenat, Cels. t. 89." The only word on the sheet is "*Schoenanthus*," written by Linnaeus. The specimen itself consists of the upper part of a culm with a few leaves and a panicle. One thing is at once clear. It is not "*Herba Schoenanthi*." Nor is it *A. Martini* (or *A. pachnodes*), unless this name is made to include the whole of Hackel's *A. Schoenanthus*. It is indeed very similar to Ventenat's figure, cited above; but this was made, as I shall have to show later on, from a specimen raised from seeds collected in Mauritius, and represents *A. pruinosus*, Nees ex Steud. The Mauritius specimens, placed side by side with Linnaeus's "*Schoenanthus*," do not exactly match it. The latter is a slender plant with narrow leaves, slightly rounded at the base, rather narrow reddish spathes and small spikelets, such as are characteristic of the Chinese specimens enumerated by Rendle under '*Cymbopogon Schoenanthus*, Spreng., var. *caesius* Hack.' This, I believe, gives the clue to the origin of the Linnaean specimen. We know that Osbeck, who was in Canton in 1751, on his return to Sweden in 1752 gave Linnaeus a complete set of his collection ("Pastor Osbeck gave me one of every species he found in China and Java").§ We further find in Osbeck's "Voyage to China and the East Indies," vol. i., p. 346, this passage: "Among the hay which was given to our cow in the

* Munro in Journ. Linn. Soc., vol. vi. (1862) pp. 46, 48.
† Parkinson, Theatrum Botanicum (1640).
‡ Munro in Journ. Linn. Soc., vol. vi. (1862), p. 52.
§ B. D. Jackson in Proceed. Linn. Soc., Sess. 1887-88, p. 21.

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factory (in the suburbs of Canton) I found the following scarce grasses . . . *Andropogon Schoenanthus*," and later on in his Flora Sinensis (vol. ii. p. 364) "*Andropogon* 1. *Schoenanthus*." This by itself is conclusive evidence for the assumption that the specimen named "*Schoenanthus*" in Linnaeus's herbarium is Osbeck's, and therefore of Chinese, not Indian, origin. Moreover, Mr. B. D. Jackson pointed out to me that a specimen named "*A. Schoenanthus*" appears already in a manuscript catalogue of Linnaeus's herbarium drawn up about 1754. This date includes Osbeck's collection whilst it excludes all contributions of Indian plants, which Linnaeus may have received, with the exception of the small set which Olaf Toren sent him from the west coast of the peninsula in 1751. Linnaeus may, of course, have had Osbeck's specimen in his mind, when adding "India," using that term in a very vague way as often was the case in those times. But, however that may be, the determination of Osbeck's specimen as *A. Schoenanthus* and its presence under that name in the Linnaean herbarium only proves that Linnaeus also made mistakes. The supposition that the sheet written up by Linnaeus as "*Schoenanthus*" was really intended to serve as the "type" of his *A. Schoenanthus* is in the circumstances untenable, and it is therefore only reasonable that the name *Schoenanthus* be restored to the species which for 2,000 years had been known by it.

HISTORY OF "HERBA SCHOENANTHI."—When in 1881 Emil Brugsch Bey discovered the tomb of Deir-el-Bahari in the necropolis of Thebes, the secret vault which contained the coffins of so many illustrious kings also yielded a remarkable profusion of botanical treasures: funeral wreaths which the kings of the 20th or 21st Dynasty (between 1,200 and 1,000 B.C.) had deposited on the sarcophagi of their predecessors, offerings of fruits, lichens, bundles of a grass (*Desmostachya bipinnata*) and quantities of the straw of another grass which Professor Schweinfurth* recognised as "*Gymnanthelia lanigera*" (a rarely used synonym of *C. Schoenanthus*). Some of the inflorescences were still in excellent condition. Even "the odour of the grass was preserved to a certain extent in the mixture of the offering." So early begins the history of the grass. Then the grass was found under similiar conditions in the tombs of the cemetery of Hawara† in the Fayum, again associated with *Desmostachya bipinnata*. According to Professor Flinders Petrie some of the tombs were probably‡ of the 20th, 26th and 30th Dynasties, but most were Ptolemaic. According to Loret§ the grass is also frequently mentioned in hieroglyphic perfumery receipts as 'Aethiopian cane,' 'rush of the Sudan,' and 'Cyperus of the West.' Whether all of these names actually refer to *C. Schoenanthus* or not, the finds of Deir-el-Bahari and Hawara afford in any case indisputable proof of the high place which was assigned to the grass 3,000 years ago. To-day *C. Schoenanthus* does not grow in the neighbourhood of old Thebes or in the Fayum; it has in fact, with one exception,

* Schweinfurth in Nature, vol. xxviii. (1883), p. 113.
† Newberry in Flinders Petrie, Hawara, Biahmu and Arsinoe (1889), p. 53.
‡ Flinders Petrie, l.c., p. 8.
§ Loret, Flore Pharaonique, (1887), p. 11.

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never been observed in the Nile valley north of the Baiuda Desert (16°–18° N.), the exception being some specimens collected by Bové* in the desert near Cairo in 1829. Schweinfurth identified the *Andropogon* of Deir-el-Bahari more particularly with the article which nowadays is brought down from the Sudan and sold in the bazaars of Cairo as a medicinal drug under the Arabic name 'Mâhareb.' We shall, however, hear presently that the African *Schoenanthus* was considered by the ancients to be of very inferior quality, and it is therefore more likely that at least a part of the supply for Thebes and Hawara came from the Arabian trade emporia on the Red Sea; so far indeed as the Ptolemaic period is concerned we know this for certain.

It has been suggested that the 'Kaneh bosem' or 'Kaneh hattobh,' the "good" or "fragrant" reed of the Bible was also *C. Schoenanthus*. It may, of course, be assumed that the old Hebrews knew the grass; but how far it answered to those terms, is difficult to say, considering the vagueness of the passages in which they occur. The first Greek translators of the Bible, however, rendered them as "Κάλαμος ἀρωματικός," which was very generally put down as a product of India.

The early connections which existed between Egypt and ancient Greece, possibly also those with Phoenicia, may have made the Greek doctors familiar with *C. Schoenanthus* at a remote date. Hippocrates (460–357 B.C.) knew it as 'σχοῖνος'† κατ' ἐξοχήν, or in connection with the epithets ἡδύοσμος, εὔοσμος and εὐώδης.‡ He does not attempt to describe it. It was evidently an article familiar to those of his contemporaries for whom his treatises were written. It is only gradually that we learn more about it until at last we have undisputed evidence of the meaning of those terms which were handed on, mainly in prescriptions, from generation to generation. Theophrastus§ (390–305 B.C.), mentions σχοῖνος among the aromata, and he makes the first attempt to fix its origin. He indicates two localities as its home. One is "on the other side of the Libanon" in the marshes of a lake which can easily be identified as Lake Huleh (Lake Merom of the Bible) in Galilee. So far, he is no doubt wrong, for *C. Schoenanthus* is not a marsh plant and has never been observed there. Its nearest station is some 270 miles north-east of Lake Huleh, on the Euphrates. The other habitat mentioned by Theophrastus is Arabia, of which he says "the steppes are, as is common knowledge, fragrant with the exhalation of the grass" ("in Arabia aspirationem agri odoratissimam esse inter omnes constat"). Dioscorides‖ (circa 77 A.D.) takes us a step further. He too knows the Arabian variety and accords the first place to it, particularly to that which comes from Nabataea. Then there is a Babylonian kind, also called τευχίτης, and an inferior variety

* According to his own labels; but he does not mention the grass in his Relation abrégée d'un voyage bot. in Ann. Sc. Nat. sér. 2., vol. i. (1834), pp. 72–76.

† Hippocrates, ed. Anutii Faësii, Francf. (1595), sect. v., p. 138, line 16.

‡ According to Stephanus, vii., p. 1682, A and B. *See also* Kirchner, Bot. Schrift. Theophrastus (1874), p. 493.

§ Theophrastus, Hist. Plant. Illustr. J. B. Stapel, lib. ix., p. 1004.

‖ Dioscorides Anaz., De Materia Medica, ed. Sprengel, p. 31.

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from Africa (Libya). As *C. Schoenanthus* has not so far been observed in Arabia north of 18° N., we must assume either that the author took the term Nabataea in a wider sense than we do in confining it to Arabia Petraea, or that the article arrived through Nabataean channels, whence Nabataea acquired the reputation of being the home of the drug. Considering the position which that region long occupied in the commercial relations of Arabia with the Levantine countries, the latter explanation is the more probable. The source of the 'Babylonian' article is undoubtedly that small and rather isolated area which extends from Rakka* on the Euphrates east and south-east to the Turco-Persian frontier. Plinius† (23–79 A.D.) merely repeats Theophrastus' and Dioscorides' statements concerning the origin of σχοῖνος, or as he calls it, *Juncus odoratus*. Galenus‡ (131–200 A.D.) also refers to Arabia as the home of the σχοῖνος, adding that he does not know why it is vulgarly called "σχοίνου ἄνθος," there being as a rule no flowers with the grass as imported from Arabia: for the camels are very fond of it and eat off the tops. This is the first time that σχοίνου ἄνθος is mentioned. Its Latin equivalent, however, '*Schoeni odorati flos*,' occurs already in a prescription of the Roman surgeon Scribonius (about 40 A.D.). On the other hand the contracted form '*Schoenanthus*' (Squinanthus) does not appear until the fourth century when Palladius§ uses it in a recipe for spicing wine. That the inflorescences, however, were used and valued long before Galenus is evident from Dioscorides, who says (l.c): "Usus est floris culmorum radicisque" and recommends for medicinal purposes the selection of many-flowered (πολυανθῆ) specimens. Possibly it was just the rarity of the flowers which enhanced their value in the Greek and Roman markets. As a medicinal drug it was chiefly appreciated as an active carminative, diuretic and emmenagogue. I have referred to the use of σχοῖνος for spicing or perfuming wine. It is already recorded by Cato‖ (223–149 B.C.). For that purpose it was either pounded in mortars (Cato) or boiled with the wine (Columella).¶ Similarly it was used for aromatising oil, and the '*oleum juncinum*' of Plinius** was probably nothing but olive-oil perfumed with '*Schoenanthus*.' In a similar way it entered into the preparation of laurel-, rose-, and quince-oil (Dioscorides),†† and was no doubt, even in those remote days an ingredient of cosmetics and perfumes, so that Propertius‡‡ could very well say: "Afflabunt tibi non Arabum de gramine odores, sed quos ipse suis fecit Amor manibus."

It is quite in keeping with the general character of Greek and Roman literature that we do not meet with any serious

* Rauwolf, Beschreib. Raiss. Morgenländ. (1583), p. 160.
† Plinius, Nat. Hist.; ed. Dalecamp. (1615), lib. xii., cap. xxii., p. 256.
‡ Galenus, Lib. de antid. i., cap. xiv., according to Stapel in his edition of Theophrastus, l.c.
§ Palladius, Agricultura, xi. (October), 13.
‖ Cato, De Re Rust., cap. civ. (p. 45 of ed. Lugd., apud Gryphium, 1541).
¶ Columella, Rei Rust., lib. xii., cap. xx.
** Plinius, l.c., lib. xv., cap. vii.
†† Dioscorides, l.c., pp. 55, 57, 58.
‡‡ Propertius, ii., 29, 17–18.

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attempt at describing an article like σχοῖνος. In fact, the only reference to it which contains a descriptive element is in Dioscorides* where he gives instructions for the selection of the material :—it is to be fresh, reddish (ἐμπύῤῥον), many-flowered, purplish and whitish when split apart (*i.e.*, when the leaf-bases, which are purplish and white, are pulled apart), to emit an odour like roses when rubbed in the hand, and to have a hot, pungent taste. The use of the drug continued in the West after the downfall of the Roman Empire, although apparently only for medicinal purposes, through the Middle Ages and even into the 18th century, when it gradually became obsolete. We find it in the prescriptions of Aëtius (450 A.D.), and in the writings of the School of Salerno. Here the name '*palea camelorum*' may have originated. At least it is attributed to Matthaeus Platearius (about the middle of the 12th century) in the various editions of the Ortus Sanitatis,† although it may, of course, be much older, as Galenus had already connected the '*Schoenanthus*' with the camel. In the Ortus Sanitatis we also find the first figure intended to represent the '*Schoenanthus*' or '*Squinanthus*,' as it is called there. It is so conventionalised as to be unrecognisable. From Brunfels‡ (1536 A.D.), onward it is a standing article in all the herbals of the 16th and 17th centuries, and is the subject of sometimes elaborate discussions in the commentaries on Dioscorides, Plinius, and Theophrastus. It was very frequently figured in those works, the figures being drawn from the mostly barren leaf-tufts as they reached Europe. Sometimes inflorescences more or less conventionalised were added. One of the earliest of those figures, by Lobel§ (1576 A.D.), is among the best. A very good description of the drug was given by Joh. Bauhin (1658 A.D.).‖ Finally in 1692 we have Plukenet's¶ description and figure, which I have mentioned on p. 303. Both are indifferent; but they are supported by Plukenet's original specimen which still exists in his herbarium at the British Museum, and is the typical '*Schoenanthus*' of the old herbalists. On this, and on this alone, Linnaeus based the '*Lagurus*' of his Materia Medica, which is—if I may say so—the backbone of the *Andropogon Schoenanthus* of the 'Species Plantarum.' To finish my account of the '*Herba Schoenanthi*,' I now turn once more to the East. We have seen that the Nabataean *Schoenanthus* was, in the times of Dioscorides and Plinius, more valued than any other, and I have already pointed out that it was called Nabataean more likely because it came viâ Nabataea than on account of its growing there. In connection with this, it is interesting to note that according to Meyer,** Qûtsami's "Book of Nabataean Agriculture" actually enumerates 'Idshir' (Izkhir, the Arabic name of *Schoenanthus*, quâ drug), but with the epithets 'Babylonian' and 'that of Hedjas,' and not as Nabataean. Meyer quotes from Ibn Alawwam's 'De Agricultura,' who in turn quotes largely

* Dioscorides, l.c., p. 31.
† Ortus Sanitatis, Matth. Sylvatici (1511), cap. ccccliii.
‡ Brunfels, Nov. Herb., vol. ii. (1536), p. 100.
§ Lobelius, Stirp. Hist. (1576), p. 42.
‖ J. Bauhinus, Theatr. Bot. (1658), p. 165.
¶ Plukenet, Phytogr., tab. 190, fig. 1.
** Meyer, Gesch. d. Botanik, vol. iii., p. 61.

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from the Arabic translation of Qûtsami's great work which, again according to Meyer, was probably written in the 2nd or 3rd century of our era. How far this is correct, I must leave others to decide, but the statement about the origin of the '*Schoenanthus*' is quite consistent with Dioscorides' and Plinius' accounts, whilst the mention of the Hedjas, where the grass has actually been collected, satisfactorily fixes the home of the Nabataean 'σχοῖνος'. Ishag Ben Amrân* of Bagdad (died 903 or 905 A.D.) also mentions the Hedjas as the country producing the best *Izkhir*. It comes next to that of Antiochia, whilst the African is the worst. The *Izkhir* of Antiochia is evidently the 'Babylonian' variety, Antiochia being merely the market whence it was distributed. Avicenna† (980–1037 A.D.) too distinguishes two kinds, the Arabian and an inferior 'foreign' (Ajami) kind. As may be expected there is more freedom in the way in which the Arab writers treated the subject, as some of them must have known the grass in the field or at any rate had first-hand evidence. Thus Abu Hanifadt‡ (died 895 A.D.) gives a description of it which could only have been made from autopsy. I quote it: "*Izkhir* is a plant with a root deep down in the ground and slender, very fragrant culms, like rush or papyrus, but finer and with smaller joints. It has tufted infructescences (fruits) like the panicles of the reed, but more delicate and smaller. It is pounded and mixed with perfumes. It rarely grows solitary. Where it has settled, it may be seen to spread and cover the ground; it inhabits plains and desert land. When it dries up, it turns white." Like the old Greek doctors the Arabs prescribed it for the preparation of unguents, theriacs—among them the famous Electuarium Mithridatis—and oils. Ibn Baithar§ quotes from the 'Books of Experience' the method of preparing the latter thus: "Take of the flowers of the grass, put them in double the quantity of oil of unripe olives . . . press the whole well and throw the flowers away; take another lot of flowers and put them in the oil. Repeat this three times in the hot season." From the Arab writers the drug passed naturally into the Persian pharmacopoeias, as for instance the 'Ulfaz Udwiyeh' of Mohammed Abdullah Shirazi‖ (1450 A.D.), and the 'Pharmacopoea Persica' of Frater Angelus¶ (1681 A.D.). Whence the Persians got their supply of '*Izkhir*' is not quite certain. So far the grass has been found only in a few localities in Persia and nowhere in quantity. It was probably mostly Arabian. Still Kaempfer** speaks of a "Persian and an Arabian Schoenanthus." Considering the part which Arabian and Persian doctors played at the courts of the Mahometan princes of India it would be surprising if the ingredient of so many theriacs, electuaries and other preparations had not also found its way into the Indian dispensaries. We possess a fairly full account of an instance of import of '*Izkhir*' under rather remarkable circumstances in Garcia de Orta and

* *See* Ibn Baithar; transl. Sontheimer, vol. i., p. 19.
† Avicenna, Lib. Canon. ed. A. Alp. Bellun. (1555), p. 160.
‡ *See* Ibn Baithar, transl. Sontheimer, l.c.
§ Ibn Baithar, transl. Sontheimer, l.c.
‖ Ulfaz Udwiyeh, transl. Gladwyn,
¶ Pharmacopoea Persica (F. Angelus), pp. 108, 109, 301, 302, 307, 312.
** Kaempfer, Amoen. Exot. (1712), p. 772.

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Acosta. This is what Orta,* in Clusius' edition of the Aromata, says: "*Juncus odoratus* grows in great abundance in the Arabian provinces of Mascat and Kalhat. The natives call it '*Sachbar*,' some also '*Haxis cachule*' (Hashish ghasul), that is lotion grass . . . and the flowers '*Foca*' . . . With the Indians no special name has arisen; but they dub it Mascat grass, some also Mecca grass, and also Camel Hay. There are in those countries plenty of asses, mules, horses, etc., which know no other fodder. . . . It is imported into India for medical purposes; but the greatest quantities come with the horse-dealers (of Mascat and Kalhat) who take it tied up into bundles with them in their ships to use it as litter for their horses . . . I remember that at Diu they sold many bundles of *Juncus* for a mere trifle; . . . but the natives do not appreciate it, as they are a rough and savage people, and they do not use it. We, however, and the Arab and Persian doctors employ it. The (Arab?) natives wash themselves and their beasts with it." In the 'Coloquios dos simples e drogas' the same author† also observes that the Arab and Persian doctors in India call it by its Arabic name *Izkhir* (*Adhar*, as he renders it) and the learned physicians of the Nizam of Haiderabad, 'Esquinanto,' and they are well aware that this is a Greek name. The grass has been collected in the interior of Mascat by Aucher and Bornmüller, and although I cannot find any reference to its growing there so very profusely, there can be no doubt that Orta's and Acosta's accounts are substantially correct. The horse trade from Arabia to India ceased, or was in any case greatly reduced, when the Portuguese dominion in the Indian Seas came to an end, and with it most likely the import of '*Izkhir*' into India disappeared. For this there was also another reason; the Indian drug dealers must soon have found out that they not only had the same grass growing in the Panjab, but also that it came in its properties so near to other indigenous aromatic grasses with which the native doctors had long been familiar that the foreign article could well be dispensed with. The influence of the Persian physicians and the reputation of their pharmacopoeias were sufficiently weighty also to transfer the foreign name '*Izkhir*' to the native drug. Not only was and still is the *C. Schoenanthus* of the Panjab‡ sold in the bazars as '*Izkhir*,' but the name has also passed on, with or without the qualifying epithet '*ajami*' (foreign) or '*Hindi*,' to *Vetiveria zizanioides* (*A. muricatus*) and other indigenous aromatic grasses, so that it has become with certain writers almost a generic name. Thus the '*Izkhir*' of the '*Abir Izkhir*' of the Ain-i-Akbari§ (end of the 16th century) is *V. zizanioides*; the 'Taleef Sherif'‖ has '*gundheel*' (*C. Martini*) as synonymous with '*Izkhir*,' and the author of the 'Makhzan-el-Adwiya' (1771 A.D.)¶ enumerates no fewer than six Hindi synonyms for '*Izkhir*,' most of them vernaculars of *C. Martini*. It will be seen that the vernacular synonymy of *C. Schoenanthus* was, in India at any rate, just as confused as the scientific nomenclature of the species at present is.

* Garcia de Orta, Arom. Hist. lib. i., cap. xxxiv. (in Clusius, Exot., p. 203).
† Garcia de Orta, Coloq. Simpl. e drog. (ed. 1872), pp. 197y, 199y.
‡ Baden Powell, Punjab Prod. (1868), p. 383; *Andropogon iwarancusa* in part.
§ Hooper in Calcutta Review, Oct., 1904.
‖ Taleef Sherif, transl. Playfair, p. 129.
¶ Dymock, Veget. Mat. Med. Western India, ed. 2 (1885), p. 851.

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CONFUSED CONCEPTION OF LINNAEUS'S ANDROPOGON SCHOENANTHUS.—The second edition of the Species Plantarum* (1763) agrees with the first in the definition of *Andropogon Schoenanthus*. Previous, however, to its publication Linnaeus had already added to it Rumphius' '*Schoenanthum Amboinicum*'† as a synonym, and this was kept up in the following editions. For a fuller account of this reduction I would refer the reader to *Cymbopogon citratus*. The identification was accepted by Lamarck,‡ Willdenow,§ Roxburgh‖ and others, and was gradually extended so as to include a number of other species, as will be seen from the paragraphs dealing with their history. An important factor in this development was the publication of a description and plate of '*A. Schoenanthus*, L.,' from cultivated specimens, by Ventenat,¶ which requires therefore to be explained. Lamarck, in 1783, stated that "*Andropogon Schoenanthus*"—he included under it (α) Rumphius' plant (= *A. citratus*, DC.), (β) Rheede's *Kodi-pullu* (= *A. flexuosus*, Nees ex Steud.) and (γ) the same author's *Ramacciam* (= *A. muricatus*, Retz.)—was cultivated in the Jardin du Roi (Jardin des Plantes) and that he saw living specimens of it. Mr. H. Hua, who kindly looked up the Lamarckian specimens of '*A. Schoenanthus*,' informs me that there are no specimens from the Jardin du Roi in Lamarck's collection. What they actually were we therefore do not know. Seventeen years later we hear again of '*A. Schoenanthus*' being in cultivation in Paris, but this time in the garden of J. M. Cels, the distinguished horticulturist. Ventenat gave an elaborate description of it, accompanied by a very good plate. He does not say where it came from, but merely states that it had been growing there for several years. On the other hand, he indicates, just as Linnaeus did, India and Arabia as the home of the species. Fortunately Ventenat's original specimen is preserved in Delessert's collection at Geneva, and with it are two other sheets of exactly the same plant, collected by Riche. One of them is labelled: "*Andropogon Schoenanthus*, Linn., Hort. Cels. pl. ex Indiâ, *Riche*. Herb. de Ventenat"; the other contains merely the words "Indes—*Riche*." Riche was the naturalist on board the 'Espérance,' one of the vessels sent in search of the 'La Pérouse.' After having been forcibly detained on the return voyage with other members of the expedition in Java, he went to Mauritius (Isle de France) in May, 1794, returned to Java in August or September, and in the following year sailed again with Labillardière and others of his colleagues for Mauritius, which they reached in May, 1795. Labillardière stayed there till late in the autumn and arrived in France in the spring of 1796. Whether Riche returned with him or in the following year with Lahaye, another of the naturalists of the expedition, I do not know. In any case this much is certain; Riche never was in India, and Ventenat's '*A. Schoenanthus*' was raised from seeds collected by Riche in Mauritius about 1795. The indication "Indes" originated evidently from the vague sense,

* Linnaeus, Spec. Plant. ed. ii. (1763), p. 1481.
† Rumphius, Herbar. Amboin. vol. v. (1750), p. 181, tab. 72.
‡ Lamarck, Encycl. vol. i. (1783), p. 375.
§ Willdenow, Spec. Pl. vol. iv., part ii. (1806), p. 915.
‖ Roxburgh, Fl. Ind., ed. Carey & Wall., vol. i. (1820), p. 278.
¶ Ventenat, Hort. Cels. (1800), tab. 89.

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already adverted to, in which that term was frequently used in earlier times. Ventenat's '*A. Schoenanthus*' has, of course, nothing to do with the classic "*Schoenanthus.*" It is what was subsequently issued by Sieber from the same island as *A. aromaticum* and described as *A. pruinosus*, Nees, by Steudel,* a form very closely allied to *Cymbopogon polyneuros* (*Andropogon versicolor*), of the Nilgiris and Ceylon.

The vagueness of Linnaeus's diagnosis and the absence or extreme rarity of herbarium specimens at that time on the one hand, and on the other the precision of Ventenat's description and figure, explain sufficiently why henceforth his '*A. Schoenanthus*' was very generally taken as the type of that species, although it remained assigned to Linnaeus as the author. The identity of Linnaeus's original '*A. Schoenanthus*' was, however, further obscured by the circumstance that in the very year (1800) in which Ventenat published his plate of a Mauritius grass under the name of '*A. Schoenanthus*,' Desfontaines† described the old '*Schoenanthus*,' which he had collected in Tunis in 1783 or 1784, as a new species, viz.: *A. lanigerum* (sic). Desfontaines, who in 1800 would know the *A. Schoenanthus* of his friend Cels if he did not already then grow the grass himself in the Jardin des Plantes—he did so in 1804‡—must of course, have considered himself quite justified in doing as he did. The confusion has not entirely escaped the attention of botanists, as for instance of Nees and Steudel, but it soon became so great that their efforts have resulted in merely further complicating the nomenclature.

OIL OF CYMBOPOGON SCHOENANTHUS.—I have already pointed out the use, which was made of '*Schoenanthus*' in ancient Greece and Rome and also in the Orient, for aromatizing oils. The same use is recorded by the author of the 'Tuhfat-el-muminin' (1669 A.D.), but he also mentions, according to the 'Pharmacographia Indica' (vol. iii. p. 558), "a distilled water prepared from *Izkhir*." It is, however, not quite clear which '*Izkhir*' is meant. On the other hand Kaempfer§, who travelled in Persia from 1683–1688, speaks distinctly of the distillation of oil from Persian and Arabian '*Schoenanthus*,' but whether he refers to it only as a casual experiment or as an industry is not said. If the latter, it cannot have been on more than a very moderate scale, such as we find in existence in the Panjab. Edgeworth,‖ who is the first to mention the grass (under *A. Ariani*) from North-Western India, made the following note on a label accompanying a specimen collected by him near Firuzpur in 1840, and now in the Wallichian collection of the Linnean Society: "An essential oil expressed from the roots, manufactured only at Kasúr in the Punjab." This is probably the same kind of oil which Vigne records from Hassan Abdal (between Attok and Rawulpindi) with these words: "A stimulating oil is extracted and used in medicine." Mr. Drummond assures me that a family of priests at

* Steudel, Syn. Pl. Glum. vol. i. (1855), p. 388.
† Desfontaines, Fl. Atl., vol. ii. (1800), p. 379.
‡ Desfontaines, Tabl. École Bot. (1804), p. 14.
§ Kaempfer, Amoen. Exot. (1712), p. 772.
‖ Edgeworth in Journ. Linn. Soc., vol. vi. (1862), p. 208.

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Kasúr produced this oil quite recently. Dymock* obtained from the grass purchased in the bazar an essential oil with an odour like that of Elemi oil (Schimmel & Co.), probably due to its Phellandrine content. The yield is rather large, 1 oz. of oil to 6½ lbs. of the dry grass.

This is then all that is left of the once much-prized drug: a few dusty bundles of hay in oriental bazars, a few ounces of oil, and the ancient name under cover of which other grasses have found their way into the pharmacopoeias and the chemical industry of our day. There seems to be, however, no reason why the old article should not to some extent recover its lost prestige, at least in the province of perfumery, which is ever in search of change and variety.

2. Cymbopogon Jwarancusa, *Schult.*

(*Andropogon Jwarancusa*, Jones.)

Jwarancusa (Hind.)

DISCOVERY OF THE GRASS AND DERIVATION OF THE NAME.—This grass became first known (1790) through a publication on the 'Nardus Indica or Spikenard' by G. Blane,† whose brother discovered it in 1786. His account of the discovery may be worth reproducing: "Travelling with the Nabob Vizier, on one of his hunting excursions towards the northern mountains, I was surprised one day, after crossing the river Rapty, about 20 miles from the foot of the hills, to perceive the air perfumed with an aromatic smell; and on asking the cause, I was told it proceeded from the roots of the grass that were bruised or trodden out of the ground by the feet of the elephants and horses of the Nabob's retinue. The country was wild and uncultivated, and this was the common grass which covered its surface, growing in large tufts close to each other, very rank, and in general from 3 to 4 feet in length. As it was the winter season there was none of it in flower. Indeed, the greatest part of it had been burned down on the road we went, in order that it might be no impediment to the Nabob's encampments. I collected a quantity of the roots to be dried for use, and carefully dug up some of it, which I sent to be planted in my garden at Lucknow. It here throve exceedingly, and in the rainy season it shot up spikes about 6 feet high. . . . It is called by the natives Terankus, which means literally in the Hindu language, fever restrainer, from the virtues they attribute to it in that disease. . . . It is esteemed a powerful medicine in all kinds of fevers, whether continued or intermittent. The whole plant has a strong aromatic odour; but both the smell and the virtues reside principally in the husky roots, which in chewing have a bitter, warm, pungent taste, accompanied with some degree of that kind of glow in the mouth which cardamoms occasion." Banks, who received a specimen from Blane, recognised it as a hitherto undescribed species of *Andropogon*; but neither he nor Blane gave it a name. On the

*. Dymock, Warden and Hooper, Pharmacogr. Indica., vol. iii. (1893), p. 564.

† Blane, in Phil. Trans., vol. lxxx. (1790), p. 284; abridged edition, vol. xvi., p. 658.

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plate accompanying Blane's paper it is called 'Nardus Indica,' Blane being of opinion that it was the Nardus Indica of the ancients. In 1795 Jones* disposed of that theory, and also established the specific name by which it is now generally known, except in so far as it is always spelt erroneously "*Iwarancusa.*" The first letter of the name as used by Jones is distinctly J, not I. The substitution of I for J has altogether obscured the derivation of the name, which is from Jwará (fever) and ankusá (the hook used by the elephant driver to restrain his elephant), hence "fever-restrainer" as Blane and, more recently, Madden† have correctly rendered it. The grass was subsequently found by Dr. Boyd near Hurdwar, and as his specimens were distributed with Wallich's plants, it has become fairly well known. Its further history is of little interest, and may be gathered from the synonymy given on p. 354. In the Panjab it is known under the same name as *C. Schoenanthus*, viz., *Khavi*,‡ and is probably also used for the same purposes. Its affinity with *C. Schoenanthus* is, indeed, very great, and the two are, as Hackel has already pointed out, not always distinguishable with certainty. The area of *C. Jwarancusa* extends from the outer hillzone of the United Provinces into Kumaon and Garhwal, and westwards as far as Kashmir and the north-eastern Panjab. At high altitudes, as in Kumaon and Spiti, or in the dryer parts of the Panjab, it becomes dwarfed and narrow-leafed and forms a "transition state" to *C. Schoenanthus.* The latter is a characteristic desert plant, able to exist with a minimum supply of water. On the other hand, *C. Jwarancusa* is dependent on an, at least temporarily, abundant supply of water, and prefers the neighbourhood of rivers, or actually grows in the beds of torrents. It is not impossible that the distinguishing characters of *C. Jwarancusa* as compared with *C. Schoenanthus*, that is the robust state, the long, flat and relatively broad leaves, and the more composite panicles, are mainly due to edaphic influences.

3. Cymbopogon Nardus, *Rendle.*

(*Andropogon Nardus*, L.)

Citronella Grass.

FOUNDATION OF THE SPECIES AND EARLY HISTORY.—If the history of Linnaeus's *Andropogon Schoenanthus* is bewildering, that of his *A. Nardus*, the other aromatic *Andropogon* known to him, is perfectly clear. In this case Linnaeus has been quite consistent, and his references, with the exception of those to Mattioli and Bauhin, are unobjectionable. Moreover, there is still at the British Museum, in excellent preservation, Hermann's specimen of '*Pengriman*' on which the species finally rests.

Paul Hermann, chief medical officer in the Dutch East India Company's service, resided at Colombo between 1672 and 1677, and all his collections were made in the neighbourhood of that town. This fixes sufficiently the origin of the specimen which, in

* Jones in Asiat. Research. vol. iv. (1795), p. 109.

† Madden in Trans. Edinb. Bot. Soc., vol. v. (1857), p. 138. Madden has given here also another version, viz., *Jwarańsaka* (fever destroyer).

‡ Baden Powell, Punjab Prod. (1868), p. 383.

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his posthumous 'Museum Zeylanicum' (p. 26), published by Sherard in 1726, is referred to as: "*Pengriman Arundo Zeylanica farcta odore et sapore calami aromatici.*" *Pengriman* evidently stands for "*Pengiri mānā*" (*i.e.*, sour mānā), the name by which the grass is still known in Ceylon. Nicolaus Grimm,* a contemporary of Hermann, also a medical man, and also for a considerable time resident at Colombo, calls it "*Arundo indica odorata*," and says of it: "Its lower part is like that of cane and the upper like a grass. The root is rather hard, splits like wood, and is very fragrant; it resembles somewhat *Calamus*, and is divided into joints of equal length and nodes. It grows rather copiously near the town of Colombo. . . By distillation a fine oil is prepared from it, which in small doses contains all the virtues of the plant, comforting the stomach and aiding the digestion when it is disturbed by cold, slimy or fœtid humours. It is the best remedy in cases of obstructed menses, and accelerates them. A watery infusion has the same power. The plant is very good for cold and hot baths in beri-beri and in the diseases mentioned above." Hermann's specimen agrees absolutely with the ordinary Citronella grass as it is at present cultivated in South Ceylon, and there is no doubt in my mind that the grass was already in cultivation in his time, so that Grimm's note as to the grass growing copiously near Colombo would refer to plantations of the grass.

Linnaeus, like other writers before him, was inclined to find the "*Nardus Indica*" of the ancients in some reed-like grass, and thinking that Hermann's *Pengriman* might be it, called it *Andropogon Nardus*. In connection with this, it may be of interest to point out that Camus and Penzig found†, in the so-called Este Herbarium at Modena, which was formed between 1565 and 1598, a portion of a shoot of *C. Nardus* under the name of "Spigo Nardo." Others saw in it the old *Calamus aromaticus*, and it may actually have been offered, under that or a similar name, in European drug-shops. Thus, for instance, there is attached to Hermann's specimen in the British Museum the note—in whose hand I do not know—"*Calamus odoratus officinarum.*"

CONFUSION WITH LEMON GRASS.—The Citronella grass early shared the fate of the other aromatic *Andropogoneae* by becoming almost hopelessly confused. It was Ainslie‡ who first (1813) suggested that it was identical with the 'Ginger grass' of Courtallam (*C. flexuosus*) and the cultivated 'Lemon grass' (*C. citratus*), and it seems to have been known for a long time by the latter name; but as 'Lemon grass' was very generally put down as '*Andropogon Schoenanthus*,' Citronella was also frequently referred to by that name, chiefly by pharmacists and chemists. Then, the French name for 'Lemon grass' being 'citronelle,' the latter term also found its way into English literature, originally as a synonym of 'Lemon grass' in the wider sense, and later on more especially of the 'Ceylon lemon grass,'

* Grimm, Labor. Ceyl., p. 120, ex Burmann, Thes. Zeyl. (1736), p. 35.
† Camus and Penzig in Atte Soc. Natur., Modena, Mem. ser. iii., vol. iv. (1885), p. 33 (of reprint).
‡ Ainslie, Mat. Med. (1813), pp. 115 and 128.

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that is, *C. Nardus*. Pereira* (1850) seems to have been the first to use the term 'citronelle oil' as equivalent to 'lemon grass oil.'

CITRONELLA OIL AND PLANTATIONS.—J. Bell,† in his notes on the London International Exhibition of 1851, mentions "oil of citronelle, or oil of lemon grass." He says it is imported from India, "and is the produce of a grass, known to botanists as *Andropogon citratum* and by some persons considered to be identical with *Andropogon Schoenanthus*." In the Ceylon catalogue of the Paris Exhibition of 1855, p. 17, we find two distinct oils: (1) Lemon-grass oil, from '*A. Schoenanthus*,' and (2) "Citronella oil; citron oil; perfumery," and against the latter there is in the Kew copy an entry in Alex. Smith's handwriting: "Citronella oil, Andropogon." W. S. Piesse, in his "Art of Perfumery" (1855), p. 31, also refers to '*Citronella*,' saying: "Under this name there is an oil in the market, chiefly derived from Ceylon and the East Indies; its true origin we are unable to decide. In odour it somewhat resembles citron fruit, but is very inferior. Probably it is procured from one of the grasses of the Andropogon genus." Gladstone‡ (1872) and C. R. A. Wright§ (1874) were the first to examine, under the name of '*Citronella*,' the oil of *C. Nardus*, as is evident from their descriptions of the oil, but both referred it to '*Andropogon Schoenanthus*.' Even as late as 1880, it was confused with *C. flexuosus* and *C. citratus* by Bentley and Trimen,‖ who figured a specimen of the former as *Andropogon Nardus*. In 1883 'Citronella' was at last clearly confined to *Andropogon Nardus* by Watt,¶ who gives the average exportation of citronella from Colombo as amounting to about 40,000 lbs.; the exact return for 1864 was 622,000 ounces. In 1872 the export had risen to almost 100,000 lbs. (1,595,257 ounces), in 1887 to 551,706 lbs., and in 1899 to 1,478,756 lbs. Since then it has fallen to 1,282,471 lbs. in 1905. The area under cultivation is at present estimated at between 40,000 and 50,000 acres, and is almost entirely confined to the Southern Province, mainly between the Gin Ganga in the north-west and the Walawi Ganga in the east.

Outside Ceylon *A. Nardus* has been in cultivation for some time in Penang, whence Citronella oil is mentioned as early as 1872 by Gladstone,** and in the Straits Settlements and Java. When it was introduced into the Malay Peninsula and Java is uncertain, but it cannot have been very long ago. McNair, in his book, "Perak and the Malays" (1878), p. 73, speaks of "the flourishing growth of citronelle and lemon grass, from which essential oils are extracted," as worth mentioning; but in 1886, Cantley†† complains of the insufficient attention which the cultivation of these two grasses receives in the Straits, and in 1900 the total area of citronella estates in the peninsula was estimated at only 2,000 acres at the highest.‡‡ In Java it is mentioned by

* Pereira, Elem. Mat. Med., ed. 3 (1850), p. 1027.
† Pharm. Journ. & Trans., vol. xi. (1852), pp. 18 and 19.
‡ Gladstone in Journ. Chem. Soc., vol. xxv. (1872), p. 1.
§ C. R. A. Wright, in Year Book of Pharm. (1874), p. 631.
‖ Bentley and Trimen, Med. Pl. tab. 297.
¶ Dict. Econ. Prod. India, vol. i., part iv., p. 5.
** Gladstone, Pharm. Journ., ser. 3, vol. ii. (1872), p. 746.
†† Straits Settl., Rep. Forest Dept. (1886), p. 15.
‡‡ Gildemeister and Hoffmann, Vol. Oils (1900), p. 299.

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Romburgh* in 1892 as 'Roempoet sereh wangi' under *A. Iwarancusa*, and is stated to have been introduced into the 'Cultuurtuin' in 1891. He drew the attention of Schimmel & Co. to the oil prepared from the Javanese crop; this reference eventually led to the establishment of citronella distilleries in Java. According to Gildemeister and Hoffmann,† both the Malay Peninsula and the Java grass represent the 'Maha Pengiri' variety. Quite recently experiments in growing Citronella grass have been made in the West Indies.

VARIETIES OF CITRONELLA GRASS.—Two kinds of Citronella grass‡ have recently been distinguished by the growers: 'Maha Pengiri' (the Great Pengiri), and 'Lenabatu or Lana Batu Pengiri,' or briefly, 'Lenabatu.' The former is also known as 'Old Citronella Grass,' or 'Winter's Grass,' because it is now almost exclusively grown by Messrs. Winter & Son; the other is spoken of as 'New Citronella Grass." Specimens of both varieties received at Kew from Galle, so far as they go, do not show any morphological differences. I must, however, add that the inflorescences of both are very defective, and one is distinctly diseased, so that no complete comparison is possible. The Old Citronella Grass is described§ as a surface feeder which soon grows out of the ground and gets exhausted, dying off after 10 or 15 years of cultivation; and it "has somewhat broad leaves, and the bushes formed are larger than the second" (*i.e.*, Lenabatu). It yields a finer oil, but the necessity of frequent replanting has led to its being more and more replaced by the Lenabatu variety. The chemical differences of the oils derived from the two varieties are mainly in the proportional amount of citronellal and geraniol, Maha Pengiri containing 50·45 per cent. of citronellal and 38·15 per cent. of geraniol, and Lenabatu 28·2 per cent. and 32·9 per cent. respectively.

ORIGIN OF CITRONELLA GRASS.—*C. Nardus* in its typical form—that is, the form represented by Hermann's specimen—is only known in the cultivated state. It is an awnless grass, the valve or flowering glume of the hermaphrodite spikelet being either entire or more or less bifid, with a minute point or a very fine and short bristle from the sinus. The flowers are usually apparently normal, but do not seem to set freely, and in some cases all the spikelets are male or otherwise imperfectly developed, or they are infested with *Ustilago*. On the whole, the reproductive system seems to be debilitated. This is the case with all the specimens I have seen, irrespective of their origin, and is evidently the result of the treatment the grass has experienced from the grower, in whose interest it is that they should not flower, as, according to Gildemeister and Hoffmann,† "otherwise the tufts become too dense, become yellow within, and spoil." Still a certain amount is allowed to seed for renewing the plantations, the usual mode of propagation being apparently by dividing the bushes. The reduction or suppression of the awn is no doubt in correlation with the partial sterility of the cultivated *C. Nardus*,

* Romburgh, Plantentuin de Buitenz., 1817-92 (1892), p. 388.
† Gildemeister and Hoffmann, Vol. Oils (1900), p. 291.
‡ Winter in Chemist and Druggist, lii. (1897), p. 646; Gildemeister and Hoffmann, Vol. Oils (1900), p. 291.
§ Tropic. Agricult., vol. xvi. (1897), p. 269, and vol. xvii. (1898), p. 794.

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the wild ancestor of which we have to seek among the awned forms. It has very generally been assumed that the Citronella grass is a descendant of the wild 'Mānā' grass of the Ceylon Patanas, but it is unfortunate that there is no specimen at Kew which is definitely stated to have been collected in the wild state. Sir Joseph Hooker, however, who had the grasses of the Peradeniya herbarium at his disposal when working out the *Gramineae* for Trimen's 'Handbook of the Flora of Ceylon,' says* that there were three specimens of the wild Mānā in that collection from Galle, Maoya, and Peradeniya, and they were all Hackel's *Andropogon Nardus*, var. *nilagiricus*. Willis also states that the Mānā of the Patanas is distinct from the cultivated Citronella grass, but does not say how it differs. Now there is at Kew a suite of excellent specimens of the cultivated awnless *C. Nardus* from Mr. Jowitt's estate at Bundarawalla, and, sent with them at the same time and from the same locality, and numbered concurrently with the first, is another set which is undoubtedly '*Andropogon Nardus*, var. *nilagiricus*.' Whether they grew wild on the estate or were in cultivation is not stated. A careful comparison of both sets has convinced me that this '*Andropogon Nardus*, var. *nilagiricus*' is, as Sir Joseph Hooker has stated, actually the mother plant of the Pengiri Mānā or Citronella grass. I shall treat of the wild 'Mānā' in the next section. Here I would only add a few words concerning the Maha Pengiri and Lenabatu Pengiri. Gildemeister and Hoffmann† state, on Mr. Winter's authority, that the Maha Pengiri came from Malacca. As the Citronella grass is a comparatively recent introduction to the Malay Peninsula, and certainly does not occur there in the wild state, this can only mean that it has, possibly as an improved race, been reintroduced into Ceylon from Malacca; but as the Maha Pengiri is at the same time put down as the old or original Citronella grass of Ceylon, it is more probable that the statement is due to some mistake. As to the Lenabatu variety we have more precise information. It originated about 1885 near Matura,‡ in South Ceylon, presumably in a plantation, and in a short time almost entirely replaced the old grass on account of its being so much hardier. Mells§ says of it, "it is in general appearance very like the Mānā grass found on patanas up country." Not having seen normal inflorescences of Lenabatu, I am unable to say whether it actually comes nearer to the wild Mānā than to the Maha Pengiri.

4. Cymbopogon confertiflorus, *Stapf.*

(*Andropogon confertiflorus*, Steud.)

Mānā (Sing.).

In the preceding section I mentioned '*Andropogon Nardus*, var. *nilagiricus*, Hack.' as presumably the mother-plant of the Citronella grass. It inhabits an area extending from the Nilgiris to Ceylon. Such specimens of it as have been collected or observed

* Part v., p. 243.
† Gildemeister and Hoffmann, Vol. Oils (1900), p. 291.
‡ Tropic. Agricult., vol. xvii. (1898), p. 794.
§ Mells in Tropic. Agricult., vol. xvi. (1897), p. 269.

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in Ceylon have generally been put down as *Andropogon Nardus*, whilst from the north of the area it first became known through Hohenacker's collection as '*Andropogon nilagiricus*, Hochst.' This name has remained, however, a 'nomen nudum,' for when Steudel* described the grass from Hohenacker's specimens in 1855, he called it *Andropogon confertiflorus*. On the other hand, Hackel† in his monograph of the *Andropogoneae*, has revived the name '*nilagiricus*,' but merely as that of a variety of *Andropogon Nardus*.

Compared with Citronella grass, this differs in the normally developed (therefore on the whole "fuller") and awned spikelets. It is a coarse, erect grass with long, tufted, rather broad and internally reddish, persistent sheaths, very long stiff blades, erect, dense, though often interrupted, panicles, brownish or sometimes purplish-brown sheaths which are as long as the racemes and rather conspicuous, and pale or dark, closely-set spikelets. Nothing is known of the conditions under which it occurs in the Nilgiris, Anamallai and Palni Hills; but in Ceylon we know it to be one of the most conspicuous elements of the vegetation of the patanas; here, according to Pearson,‡ it "is found abundantly from 5,000 feet downwards, and frequently forms a belt at the edge of the patana parallel with the forest boundary; it attains a height of five feet or more. In strong sunshine it emits a sickening and almost overpowering odour of Citronella oil." Tennent, in "Ceylon" (vol. i., p. 25), also mentions the oppressive perfume of the grass, which he calls "lemon-grass (*Andropogon Schoenanthus*)," and adds that the odour makes it "distasteful to cattle, which will only crop the delicate braird that springs after the surface has been annually burnt by the Kandyans." According to Willis, it yields a good oil, but in small quantities, and there is no evidence that it is used commercially. The Singalese name is "Māna," whilst Hohenacker gives "Bāmbe" as the Nilgiri vernacular. He also observes, on the label, that it is used for thatching.

5. Cymbopogon flexuosus, *Stapf.*

(*Andropogon flexuosus*, Nees ex Steud.)

Malabar or Cochin Grass.

EARLY HISTORY AND FOUNDATION OF THE SPECIES.—Rheede,§ in his Hortus Malabaricus, figured and described under the name '*Kodi-pullu*' a grass of which he says that it has aromatic leaves, and that a drink is made of its roots to stop salivation in certain fevers. Lamarck‖ referred it under γ to '*Andropogon Schoenanthus*'; but most botanists ignored it or quoted it without any further remark under '*Andropogon Schoenanthus*' or '*Andropogon Iwarancusa*.' Yet the plate is a very faithful representation of a grass evidently very common

* Steudel, Syn. Pl. Glum., vol. i. (1855), p. 385.
† Hackel, Androp. in DC. Monogr. Phaner., vol. vi. (1889), p. 604.
‡ Pearson, in Journ. Linn. Soc., vol. xxxiv. (1899), p. 326.
§ Rheede, Hort. Malab., vol. xii. (1703), p. 107, t. 57.
‖ Lamarck, Encycl., vol. i. (1783), p. 375.

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throughout Travancore and the adjoining district of Tinnivelli. Rottler knew it and put it down, though with some doubt, as *Andropogon Nardus*, which it resembles very much indeed. Ainslie* (1813) mentions it as 'Sukkanaroo-pilloo' and 'Ginger-grass' (the exact equivalent of the Tamil name), and says of it: "This is a variety of the grass which is well known in lower India by the name of the lemon-grass; it differs, however, from it in this respect, that on being chewed, it has a strong flavor of ginger. It is very common on the Courtallam Hills in the Tinnivelli District, where the natives consider an infusion of it as stomachic and febrifuge," and later on (1826)† he adds: "the natives occasionally prepare with it an essential oil." This, I believe, is the first record of oil being prepared from Malabar grass. Klein collected the grass in 1818 on the same hills, and his specimens, which are also marked '*Suckunari pillu*, Tam.; *Ginger-grass*, Ang.; *Andropogon Nardus* (*?*),' leave no doubt as to its identity with the plant from which the Travancore or Cochin lemon-grass oil is produced. Wight subsequently distributed specimens of the same grass as '*Andropogon flexuosus*, N.E.' It was not, however, described until 1855, when Steudel‡ published a description retaining for it Nees' name; but not much notice was taken of Steudel's species which, if mentioned at all, was usually cited as a synonym of *Andropogon Nardus*, as for instance by Bentley and Trimen,§ who moreover figured it as *Andropogon Nardus*. In 1889, Hackel‖ distinguished it as a variety of the typical *Andropogon Nardus* (Citronella grass), and the same place was given to it by Hooker in the Flora of British India,¶ but neither author connected it with the Lemon-grass oil of Travancore, which very generally was treated simply as "Lemon-grass oil."

Morphologically, *C. flexuosus* differs from the other species of the *Nardus* series by its large, loose, greyish or slate-coloured panicles, the branches of which are particularly slender, long, flexuous and often drooping, and by the less conspicuous spathes and the smaller, usually very slender and acute spikelets. The basal leaf-sheaths are rather narrower than those of *C. Nardus* and *C. confertiflorus* and are not reddish within.

MALABAR GRASS OIL.—When the Malabar Grass-oil—this name, which is used in Barber's collection, is preferable to the name Travancore Lemon-grass oil—was first exported, I do not know precisely; but the "lemon-grass oil" mentioned by Pereira (1850) as imported into England from Cochin was very likely the oil of *C. flexuosus*, and not of *C. citratus*. In 1859, Major Heber Drury, writing to D. Hanbury and referring to a specimen of *C. flexuosus*,** which he had sent him, says: "From this species (and from this only) Lemon-grass oil is distilled in Travancore."

* Ainslie, Mat. Med. (1813), pp. 115 and 116.
† Ainslie, Mat. Med., vol. ii. (1826), p. 50.
‡ Steudel, Syn. Pl. Glum., vol. i. (1855), p. 388.
§ Bentley and Trimen, Medic. Pl. (1880), tab. 297.
‖ Hackel, Androp. in DC. Monogr. Phaner., vol. vi. (1889), p. 603.
¶ Hook. f., Fl. Brit. Ind., vol. vii. (1897), p. 207.
** Drury did not, however, use that name. In 1858, in his Useful Plants of India, he includes the Travancore grass in *Andropogon citratus*, and six years later, in his Handbook of the Indian Flora, vol. iii., p. 640, in *Andropogon Schoenanthus*.

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Four years later Hanbury received the same plant from E. G. Waring, with this note: "Andropogon (?) which yields the Lemon-grass of Travancore—abundant on the plains—is not cultivated." The statement in the Pharmacographia Indica, vol. iii. (1893), p. 565, that the oil is distilled in Travancore from Anjengo northwards, and that the grass is burnt at the end of the dry weather, no doubt also refers to *C. flexuosus*, and not to *C. citratus*, as the authors of that work believe. It is probably due to this confusion that Gildemeister and Hoffmann say, quoting Dymock, Warden, and Hooper as their authorities, that "the grass is *cultivated* on a large scale only on the Malabar coast in Travancore, on the western slope of the mountains, north of Anjengo." Mr. T. F. Bourdillon writes quite recently from Quilon that only within the last year or two extensive areas have been planted up with the Malabar grass. As the Travancore grass oil is not, in commerce, specifically distinguished from the oil of *C. citratus*, both being sold as 'lemon-grass oil,' it would be interesting to know how far the analyses of 'lemon-grass oil' refer to the one or the other. Certain discrepancies in the results obtained by chemists may have their origin in the indiscriminate use of the term.

Assuming that the whole of the 'lemon-grass oil' exported from the Malabar Coast is referable to *C. flexuosus*, the figures for the export of that oil were, for 1896-97, 270,000 kilos, or 595,080 lbs.

6. Cymbopogon coloratus, Stapf.

(*Andropogon coloratus*, Nees, ms.)

Under the name of '*Andropogon coloratus*, N.E.,' Wight distributed a grass (numbered 1703) which although similar to *C. flexuosus* differs from it distinctly in its much smaller stature, narrow blades and leaf-sheaths, dense and erect panicles, more conspicuously bearded rhachis-joints and pedicels—the white hairs contrasting vividly with the brownish spathes—and much swollen pedicels at the base of the racemes. No description of it as a species was published; but in 1896 Hooker* distinguished it as a variety of *Andropogon Nardus*. A similar form, but taller with longer, stiff and dense panicles and paler spathes was issued by Wight at the same time as "*Andropogon* (*Cymb.*) *caesius* γ *elatior*, *culmo erecto firmo*," No. 1700*c* and in a diseased form under No. 1700*d*, the panicles of the latter being infested with an *Ustilago* and barren. The state represented by No. 1703 was also collected by Klein on the 9th of July, 1808, but where, is not stated; the taller form both in its normal and diseased states has been repeatedly gathered throughout the Carnatic from the extreme south as far as the Cuddapa District, and from the Tinnivelli hills to the Anamallais. This is also almost certainly the plant which, as I shall have to point out in another place, Roxburgh had figured (No. 1095 in his duplicate collection of drawings, now at Kew), and erroneously identified with his own *Andropogon Martini*. It is very likely that the original drawing was made at Samulcotta which might suggest an extension of the area of *C. coloratus* towards the Circars.

* Hook., Fl. Brit. Ind., vol. vii. (1897), p. 206.

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Practically nothing is known of the conditions under which this grass grows; but it has a distinctly xerophytic habit. It is a highly aromatic grass. There is, however, no evidence that it is used for extracting oil or for any other purposes, unless it is one of the 'lemon-grasses' of the Malabar district to which the following* refers: "The natives of Ernad and Waluvanad empirically distinguish no fewer than 27 species of lemon-grass, but say that only five of these varieties possess a commercial value. They also state that the most valuable of these varieties does not blossom. Ernad and Waluvanad, I am reliably informed, are full of hills on which lemon-grass grows wild and could be had virtually for the collecting." The variety which does not blossom is, I may add, very probably *C. citratus*. The vernacular names which I have been able to collect require further confirmation and revision. They are to be found in the second part of this paper under *C. coloratus*.

7. Cymbopogon citratus, *Stapf.*

(*Andropogon citratus DC.*)

Lemon Grass (κατ' ἐξοχήν); Sereh (Malay).

EARLY HISTORY IN INDIA.—In 1695, Petiver announced in his 'Museum' (p. 55, no. 586) a "Gramen *citratum* fragrantissimum e Madraspatan." A few years later Plukenet referred to the same grass in Almag. Mant. p. 97 (1700) in these words: "Gramen cyperoides citratum, Ind. Or. foliis odore corticum Citri; Vasnapillee Malabarorum." The sender of the grass was Dr. Samuel Browne, Surgeon at Fort St. George, and he, in his 'Seventh Book of East Indian Plants,'† edited and commented on by Petiver, gives the following account of it: "This is a most delicate sort of *fragrant Grass* which being rubbed smells like *Baume* and *Lime* or *Limon peel* together. The *Portuguese Women* fume their children with it, and give the *Decoction* of it with other things for *Fevers* and to strengthen weak stomachs; but the Natives use it not, which together with its growing in *Gardens* on the Sea coast and not up the Country, as I can yet observe, makes me think the Portuguese brought this from other parts and planted it here; certainly, so excellent a Plant of such *Fragrant* and *Aromatik taste* must have many *Vertues*. I use it in many cases, and generally with success. While I was writing this, in came a Person, who says, that about 30 years ago, viz., about 1666, one Antonio Palia, brought 3 Pots of this Grass from Batavia to Paliacut, one of which he sent to a Garden, here at Madrass." Browne's specimen is no longer in existence; but there can be no doubt as to what the plant was. From a note on a label in Rottler's herbarium, we know that the Portuguese in India called it 'Herba cheirosa,' the Portuguese equivalent of the Tamil Vasana-pillu, and Roxburgh in an early manuscript‡ of his Flora

* Reprint from the Madras Mail in Tropic. Agricult., vol. xxiii. (1903), p. 351.

† Petiver, Samuel Browne, his seventh Book of East Indian Plants, in Phil. Trans., vol. xxiii. (1702), pp. 1251–1252.

‡ This manuscript was long in the possession of the Govan family and is now at Kew. It is, as compared with the published "Flora Indica," much abridged.

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Indica, remarks; "Siree of the Dutch and native Portuguese in India," 'Siree' (recte Sereh) being the Malay name by which the grass was then known—as it is now—in Java, whence Antonio Palia brought it to Paliacut. Browne's account with its almost dramatic actuality was entirely lost sight of. Yet, it is evident that the name "lemon-grass" arose either out of the "*Gramen citratum*," or more probably concurrently with it out of the same association of ideas; in print it appeared for the first time in 1804, in Donn's third edition of his Hortus Cantabricensis (p. 183). There it was applied to a grass which in 1786 had been introduced by Banks from the East Indies, as we know from Aiton's second edition of his Hortus Kewensis (vol. v., p. 427). Under the same name it was grown at Kew in the beginning of the last century, and Wallich* relates that Dr. Maton, Physician to Queen Charlotte "has repeatedly been treated with a dish of Lemon-grass tea by Her Majesty who used to be very fond of it and was supplied with the plant from the Royal Gardens at Kew." There are no specimens of that plant at Kew or at Cambridge; but there is a sheet at the British Museum, evidently from Banks' herbarium, written up "Hort. Dr. Roxburgh," and below that "Novis. culta (Mr. Lambert) Lemon-grass," which contains two identical specimens. My explanation is this:—in 1786, Roxburgh was in Samulcotta where he had established a garden, and it is from this garden (Hort. Dr. Roxburgh) that Banks had the seed from which the lemon-grass of Cambridge and Kew was raised. Later on, Lambert too had some plants of the lemon-grass in his garden. They flowered, and a panicle from these was preserved and placed along with Roxburgh's specimen. There is no date; but the handwriting on the back of the sheet is that of Dryander, and therefore not later than 1810. Those specimens allow us to establish with absolute certainty the identity of the "lemon-grass" of the English gardens of those days. In India itself, the name "lemon-grass" may, as I suggested above, have originated and spread even earlier. In any case, Fleming† says, that "many Europeans (viz., in India) have given the name of lemon-grass" to what he calls '*Andropogon Schoenanthus* (W),' whilst Ainslie‡ (1813) quotes it under the Tamil name, Vasana pillu. At the same time, the term soon assumed the character of a nomen genericum, as people in India became aware that there were, besides the garden grass, other wild grasses of similar appearance and properties. Thus we find Heyne (probably before 1812) using, on a label with a specimen of *C. coloratus*, the expression: "*a* lemon-grass." Similarly, Ainslie§ (1813) speaks of the Travancore grass (*C. flexuosus*) as a variety of lemon-grass. Others spoke of "lemon-grasses," and a recent writer in the Tropical Agriculturist‖ uses the phrase "27 species of lemon-grass." Others, neglecting the differences between the various kinds of lemon-grass, differences which were never clearly stated, admitted only one lemon-grass and implicitly postulated the identity of, for instance, the citronella grass with the "Gramen

* Wallich, Plant. As. Rar., vol. iii, p. 48, tab. 280.
† Fleming in Asiat. Research. vol xi. (1810), p. 156.
‡ Ainslie, Mat. Med. (1813), p. 128.
§ Ainslie, l. c., p. 116.
‖ Tropic. Agricult., vol. xxiii. (1903), p. 351.

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citratum," or of the Malabar grass with the "Gramen citratum." The result of all this was, of course, much vagueness in the term and great confusion. This becomes particularly obvious in collating the vernacular names which have been identified with "lemon-grass." There were other causes also which tended to obscure the history and the characters of the original "lemon-grass," and finally made it possible that a grass which is so widely, though not intensely cultivated, not in India only but all over the tropics should, in Hackel's great Monograph of the *Andropogoneae* (p. 605), be hiding under the cloak of an American variety of *Andropogon Nardus*, whilst its botanical name, *Andropogon citratus*, by which it has been known to Indian botanists and most pharmacists, is simply referred to with the words: "aut ad *A. Nardum* aut ad *A. Schoenanthum* pertinet" (p. 608).

Although Browne tells us that at his time the Madras natives did not take to the lemon-grass, it subsequently became fairly popular throughout the Carnatic and finally all over India. Roxburgh,* writing about 100 years after Browne, was able to say: "On the coast (of Coromandel) I have only found this elegant valuable species in a state of cultivation, few gardens being without it." Similarly, Rottler says on a label, written probably at the end of the 18th or the beginning of the 19th century, and attached to a specimen collected in the extreme south of the Peninsula: "Frequentissima in hortis." When it was introduced in Bengal is uncertain. It was in cultivation in the Botanic Gardens, Calcutta, in Roxburgh's time; but apart from this, Roxburgh seems to have only known it from the 'coast' (of Coromandel). Carey's† observation that it covers extensive tracts in Northern Bengal is wrong and refers probably to *C. pendulus*, Stapf. It is true that Fleming,‡ as well as Roxburgh,§ quotes Bengali name for it, *Gundbel* or *Gundha bena*, but that name occurs as early as the middle of the 15th century as a Hindi synonym of 'Izkhir' in the Ulfaz Udwiyah,‖ and most probably was originally applied to *C. Martini* or possibly also to one or more of the other aromatic Andropogons which are indigenous in Northern India. The Sanscrit names, *Malatrinukung* (*Malatrina*) and *Bhoostrinung* (*Bhutrina*), which Roxburgh§ quotes for the lemon-grass, are in a similar position. Concerning these I would refer the reader to my chapter on *C. Martini*. Royle,¶ in his 'List of Articles of Materia Medica obtained in the Bazars of the Western and Northern Provinces of India,' does not enumerate the lemon-grass, but he mentions it in his 'Illustrations of the Botany of the Himalayan Mountains,' p. 425 (1840), under Roxburgh's name, '*A. Schoenanthus*,' as "only found in gardens in Northern India." From the West Coast it is first mentioned by Graham** (1836). When it reached Ceylon is unknown; Moon†† (1824) mentions it, but as identical with Pangiri Māna.

* Roxburgh, Fl. Ind., ed. Carey & Wall., vol. i. (1820), p. 278.
† Carey in a footnote in Roxburgh, Fl. Ind., ed. Carey & Wall., vol. i. (1820), p. 278.
‡ Fleming in Asiat. Research., vol. xi. (1810), p. 156.
§ Roxburgh, Hort. Beng. (1814), p. 7, and Fl. Ind. l.c.
‖ Ulfaz Udwiyah, transl. Gladwin.
¶ Royle in Journ. As. Soc. Beng., vol. i. (1832), p. 458.
** Graham, Cat. Pl. Bombay, p. 238.
†† Moon, Cat. Pl. Ceylon (1824), p. 72.

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The name, however, by which, in Ceylon, it is distinguished from the latter is Sera or Saira (the Malay Sereh), and it seems to me therefore most likely that the grass was introduced into the island during the Dutch occupation of Ceylon.

The comparatively recent date of the cultivation of the lemon-grass in India is also evident from the nature of the established vernaculars. I have already pointed out that the Tamil Vasana-pillu is merely the equivalent of the Portuguese "Herba cheirosa," under which name it was probably introduced. The term was taken up unchanged, or almost so, in Malayalim, Canarese, and Telugu. Another Tamil name, Karpūra-pullu (Camphor grass), is equally descriptive, and the same applies to the Gujerati and Marathi vernaculars, which mean 'Green tea,' whilst the Dukni name given by Ainslie,* namely, 'Naring ke bās ka ghans,' is a direct translation of "lemon-grass."

INTRODUCTION INTO AMERICA AND AFRICA.—The properties which recommended the grass to the native gardener of India also contributed to its early introduction into the colonies of those European Powers which then had possessions in India. W. Hamilton† has pointed out that the 'lemon-grass' was introduced into Jamaica most probably in 1799. From there it soon spread to the other British islands in the West Indies "as an elegant and powerful diaphoretic under the popular name of lemon-grass." It also found its way into the Spanish possessions. La Sagra‡ (1853) enumerates it under '*Andropogon Schoenanthus* (*Cymbopogon citriodorus*),' and states that it is cultivated in gardens in Cuba as 'Yerba Limon.' Grosourdy§ (1864) indicates it from Portorico as 'Limoncillo,' under which name Sintenis collected it in that island in 1884. More recently it has also been reported from Mexico as 'té limon.'‖ In the French Antilles and in French Guiana it was known in the forties, if not earlier, as *Citronelle*,¶ a name applied by the French to various aromatic herbs. Under the same name it is recorded from Mauritius by Bojer** as early as 1836, but there is no doubt that Desfontaine's†† '*A. citriodorum*' (1815) from Mauritius (Isle de France), which he identified with '*Andropogon Nardus*, Pers.,' was also lemon-grass. Very probably it was introduced under Poivré's active administration (1767–1773). "Citronelle" is also very generally grown as a garden herb in Réunion, and Baron found it in Central Madagascar in 1883. Through the Portuguese it reached East Africa—when, I do not know—and subsequently also West Africa. Welwitsch‡‡ found it, in 1859, frequently cultivated near Mossamedes, where it had been introduced from Mozambique by a Dr. Sales in 1855. He also came across it in 1854 in Loanda, whither it was said to have been brought from Sierra Leone. It is

* Ainslie, Mat. Med. (1813), p. 128.
† Hamilton in Pharm. Journ., vol. vi. (1897), p. 369.
‡ La Sagra, Fl. Cub., vol. iii., p. 321.
§ Grosourdy, Med. Bot. Criollo, vol. ii., pt. i., p. 161.
‖ Schimmel & Co., Semi-Annual Reports, Oct.–Nov., 1903, p. 27.
¶ Guibourt, Hist. Nat. Drog. Simpl., vol. ii. (1849), p. 114.
** Bojer, Hort. Maurit. (1837), p. 375.
†† Desfontaines, Tabl. École. Bot., ed. 2 (1815), p. 15.
‡‡ Welwitsch in sched.; *see also* Cat. Afr. Pl. Welwitsch, vol. ii., p. 155.

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equally grown in the Portuguese islands in the Bay of Guinea,* where it is called 'Capim de Gabão' (evidently because it originally came from the Gaboon), in the Cameroons,† in Old Calabar, and probably in other places in West Africa. With the Portuguese it also went—probably at an early date—to Brazil, where it is recorded, in the cultivated state as well as semi-naturalized, from the States Porto Allegre, Rio de Janeiro, Minas, and Alagoas, and under the name of Capim de Cheiro and Capim Siri.‡

EARLY HISTORY IN THE MALAY REGION.—Having traced the 'lemon-grass' to its introduction into the Indian Peninsula and its subsequent spread to the colonies in America and Africa, I now turn to its history in South-Western Asia, whence it came to the Peninsula. From what has been said in the preceding lines it is sufficiently clear, and it has in fact never been disputed, that the 'lemon-grass,' as understood originally, is identical with the Malay 'Sereh.' This, throughout the Malay region, is universally grown as a medicinal and kitchen herb. Its history goes back no doubt far beyond the arrival of the first European invaders. We hear of it almost simultaneously from the Philippines and from Java as early as the first half of the 17th century. In 1635, Juan Eusebius Nieremberg,§ a Spanish Jesuit in the Philippines, describes it quite unmistakably under the name of 'Tanglat,' a term still in use for 'lemon-grass' in the Tagalog and Visayan dialects (spelt Tañglad‖). The passage, which is worth quoting, reads: "Tanglat. It is a herb springing from a bulbous root, the swollen base of the leaf tufts, whitish-red without, yellowish within; from it rise 10–12 leaves, about 1 m. long, rather rough and moderately green; there is, however, neither a (flowering) stem nor fruit. The whole plant has a scent like that of lemon flowers, but stronger. Cooked, it improves the taste of stale boiled fish; put into wine it gives a pleasant flavour, and it imparts a delicious odour to sauces and spices. The liquor distilled from it is almost scentless until exposed to the sun; but this being done, it usually exhales a pleasant odour, and applied to the face seems to sharpen and invigorate all senses and the head."

Jacobus de Bondt (Bontius¶), a Dutch doctor, who died in Batavia in 1631, mentions in his notes, which were published after his death, that the Javanese used to add a small bundle of a highly aromatic grass to their dishes of boiled fish to improve the flavour, and in another passage that the Malay women diligently in their gardens cultivate the same grass, using it for baths and fomentations, particularly in female complaints, and he winds up with the exclamation: "Who would deny that this highly aromatic grass possesses still more excellent virtues?" De Bondt does not give the vernacular name of the grass which he identified with Orta's '*Juncus odoratus*' (*i.e.*, *Herba Schoenanthi*), but his account of the uses of the grass, and the critical observations which some

* Moller in Tropenpflanz., vol. iii. (1899), p. 165.
† Schimmel & Co., Semi-Annual Reports, Oct.–Nov., 1903. p. 27.
‡ Peckolt, Hist. Pl. Medic. Braz., pt. iv. (1891), p. 618.
§ Nieremberg, Hist. Nat. (1635), lib. xv., cap. xix., p. 343.
‖ Merrill, in Bull. Philipp. Gov. Lab. Bur. viii. (1903), p. 110; xxvii. (1905), p. 92.
¶ Bontius, Hist. Nat. et Med. Ind. Or., Comment. G. Pisone (1658), lib. vi., p. 148.

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50 years later Herbert de Jager made on De Bondt's unfounded identification, leave no doubt that the grass was the Sereh of the Malays. De Jager's criticism was contained in a letter to Rumphius, dated Batavia, 6th July, 1683,* where De Bondt's grass is referred to as '*Sire*' or "*Gramen Melissae Odore*," the earliest passage I can find for the use of the word "*Sire*" (now usually spelt "Sereh"), which was even then widely used throughout Malaya, for Rumphius says "Malaice, Balayice, &c.; ubique in hisce insulis." Rumphius had become acquainted with it in Amboina, where he resided from 1653 onwards, and in the neighbouring islands. He drew attention to it in a short note published in 1684,† but probably written earlier under the influence of De Jager's letter quoted above. In this note he speaks of the grass as '*Schoenanthum Amboinicum*,' and gives in an accompanying plate an excellent figure of the 'root' as he calls it, that is the heads of the branches of the rhizome with the base of the leaf-tuft springing from them, evidently just in the condition ready for use. Comparing it with the Arabian '*Schoenanthum*,' he remarks: "Schoenanthi nostratis Amboinici radices ab Arabico nonnihil discrepant. Nostrum sterile est: Arabicum floret. Radices hae odoratae sunt et acres." Then there followed, written before 1695, in the fifth volume of his Herbarium Amboinense, that long chapter‡ on 'Schoenanthum Amboinicum, Siree,' which from Linnaeus onward has been often quoted, but, I am afraid, rarely read with the attention it deserves. It is, like almost all that Rumphius has written, pervaded by that charm of directness and lucidity with which the phenomena of nature reflect themselves only to the clear and open mind of a great and unbiassed observer and sincere lover of nature such as Rumphius was. It is no exaggeration to say that there is, in his account of the Sereh, more information concerning the general features and the biology of the grass than in any other publication dealing with it. The chapter is accompanied by a figure, which represents a plant evidently taken from a garden, one-fourth natural size, and as faithful as can be. The fragment of an inflorescence which is added is less satisfactory, unless it was drawn—as is almost certain—from a diseased or anomalous panicle. I quote the essential part of Rumphius' description, translating from the Dutch text:—

"The Siree of Amboina is no doubt a *Schoenanthum*. From the Arabian *Schoenanthum* it differs in that it emits fewer stems and is sterile, or at least produces flowers only very rarely; nor is it so aromatic. It forms a dense bush of so many leaves that they hide the stem, the root and the ground immediately around them.

"The leaves are very long, narrow and thin, like those of a sedge, 3–3½ feet long, scarcely as wide as a finger, finely ribbed lengthwise, rough to touch, somewhat cutting if stroked backwards, bluish-green, and so lank that they are all bent over on to one

* Herb. de Jager in Valentini, Hist. Simpl. (1732), p. 392.

† Rumphius in Miscell. Cur. sive Ephem. Acad. Nat. Cur., Dec. ii., Anno iii. (1684), p. 80, tab. 3.

‡ Rumphius, Herb. Amboin. (cura Burmanni, 1750), vol. v., p. 181, tab. 72, fig. 2.

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another, and so form a great ball or intricate bush. A span above their insertion they are geniculate. Below that the leaf is narrow and convolute, resembling a stalk; up to that point they were originally firmly adpressed against their stem. Above the knee the leaf is flat and reflexed though the middle nerve is fairly stiff. Crushed between the hands the leaves emit a strong aromatic odour, and chewed they taste similarly, with a noticeable acridity, but without causing any burning sensation in the throat.

"The bases of those leaves form a stout and ventricose stipes or stem, closely clasping each other, resembling skins, whitish in colour and more aromatic than the leaves themselves, smelling somewhat like dried roses; and that is considered the best part of the plant.

"Although those leaves thus clasp each other and form a roundish or sometimes flattened stem, there is nevertheless inside them nothing that could be compared with a reed or rush. . . . I also observed that the odour of the Arabian plant approaches distinctly that of roses; whilst in the Amboina grass it is mixed with that of fennel. The root resembles that of Acorus, but is much shorter, thinner and more woody, divided into distinct annular joints and sparingly branched. The branches generally rise obliquely out of the ground, attached to it by hard and thin rootlets, and bearing at their ends 2, 3 or 4 of the ventricose stalks mentioned above. The remainder of the root does not penetrate much into the soil, in which it is fixed by means of numerous woody fibres. . . . Its aromatic odour and taste is more intense than in the (remainder of the) plant; it is acrid, hot, not burning, with a pleasant bitterness, and the rose odour is more distinct in the dry state. . . .

"In Amboina, the Siree is usually kept barren so that one does not see it in flower or fruit. Still it has happened, though rarely, that flowers have been observed on certain specimens, and they are of two kinds, genuine and fabulous. The genuine flowers are nothing but a panicle, as in Tuhu Sala, and in Kulong.

"The whole panicle inclines always to one side, is a span long or even longer, and composed of long tops or oblong headlets (spikelets) like oats, which are empty and have short yellowish-brown glumes, which, however, do not produce any distinct seed unless it were the inner chaffy points which, however, do not germinate. These flowers may frequently, or rather commonly, be seen in old Siree plants in Ternate, Motira and Mackian, where they form larger bushes than in Amboina, and produce leaves almost five feet long. Here a slender, straight and firm stem grows out from the centre, bearing a few leaves and the panicle described above.

"That never occurs in Amboina or very rarely. For when in 1678 some old pieces of the same kind as those of Ternate were planted in the Island of Nussatello (Nussa laut), and when about the same time suckers were taken from some gardens not far from the Galghoek near Castle Victoria (where under a rich brown soil some sharp cliffs run, and where the Siree which had been planted near by had been left uncut) and planted in other gardens near the houses, they would not behave in the same way (*i.e.*, did not flower). Similarly the Siree plants on Siree Hill, although

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they grow there spontaneously, have never been seen to flower, possibly because they are annually burnt down together with other weeds. There are however, in Leytimor, hills which also produce the grass and are not so frequently fired, and yet the Siree growing there never flowers. . . .

"*Name.* In Latin *Juncus odoratus* or *Schoenanthum Amboinicum*; but as it is common in many provinces, it might well be called *Schoenanthum Indicum sterile*, to distinguish it from the Arabian.

"(The Schoenanthum) which we describe here, occurs in all the Malayan provinces, Java, Balaya and here in the Eastern region, in gardens as well as spontaneously on breezy mountains among sedges, particularly where the soil is brown and sharp rocks underlie it as on Siree Hill, east of Castle Victoria, and on another near Naco on the south side of Leytimor, where there have been no gardens. The flowering *Schoenanthum* grows in Ternate, and several other islands in the Moluccas, as for instance in our neighbourhood in Nussatello, everywhere planted in gardens.

"On account of its pleasant aroma it is in these islands more used for culinary than medicinal purposes, and almost exclusively the bottom part of the leaf-tufts which form the ventricose stalks and can easily be pulled from the root whilst the tops are cut off to a hand's length.

"Two or three of those stalks are tied together and cooked with all sorts of fish; this imparts a pleasant scent to the gravy and is wholesome for the stomach as well as the bowels; for the *Schoenanthum* owing to its acrid and attenuating powers dilutes the slimy humours which one contracts in this country from the daily fish food. It also drives out urine, sweat and the menses; but if the system by daily use gets inured to it these effects make themselves felt less strongly unless it is used in larger quantities.

"They treat the Amboina tree-wine 'Sagueer' with it so that it keeps several months and can be shipped over sea. This is done by adding to each pot of 16 cans of fresh 'Sagueer' two handfuls of the stout stalks mentioned above, a few pieces of ginger, one or two nutmegs cut up in slices, and three or four eggs, all boiled together, and afterwards pouring the wine off into casks. It is a fierce drink, but very wholesome for mariners; and soldiers who are camping out and commonly contract dropsy, ought to derive much relief from that beverage.

"The root together with the bottom part of the stalks if half-boiled with water makes an excellent gargle for rinsing the mouth of a person who suffers much from toothache and swelling of the gums, which may be recognised from the swelling being hard and tight, but unaccompanied by sharp pricks.

"Herr Herbertus de Jager takes our Siree by no means for the true *Schoenanthum*, nor do I, but merely as a species of *Schoenanthum*."

Since Rumphius practically nothing has been added to our knowledge of the Sereh grass as it is found and used in Malaya. Its universal distribution in the archipelago, as a garden herb, has been confirmed, but no proof has been forthcoming as to it having

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been observed anywhere in a wild state. Statements to that effect have occasionally been made; but they have arisen from the confusion of the cultivated Sereh with other similar and truly wild species of *Cymbopogon*. Dr. De Vry in a letter to D. Hanbury says distinctly that it is not found in a spontaneous state in Java, and Dr. Koorders gives me the same assurance, so far as Java and Celebes are concerned; and the fact that Rumphius never found the grass in flower on Siree Hill nor on the hill near Naco, where he thought it to be wild, makes me rather believe, that here too we have merely a case of escape and secondary establishment.

East of the Malay Archipelago the Sereh has been found in native gardens or as an escape in their neighbourhood in Kaiser Wilhelmsland, in the Bismarck Archipelago,* and in Samoa and Fiji.† According to Balansa,‡ '*Andropogon Schoenanthus*, Roxb.' (that is lemon-grass), also occurs in New Caledonia rather commonly on uncultivated and arid hill-sides, flowering very rarely. The colonists, he says, prepare from the highly aromatic leaves a much appreciated drink. I have not seen Balansa's specimen; Hackel, who has, considers it as very closely approaching his '*Andropogon ceriferum*' (also a synonym of lemon-grass); but the sample was too incomplete for accurate determination. If Balansa's plant is actually lemon-grass, as is very probably the case, it is no doubt an alien in New Caledonia where it has locally established itself. When the cultivation of the grass spread to Polynesia it is so far impossible to say; probably the introduction is of old date. The derivation of the Fiji name Ca-boi (*Horne*), or Co-boi (*Seemann*) = Co-grass which Seemann§ found in use in 1860, might throw some light on it.

Turning from the Malay Archipelago to the mainland to the north and north-west of it, we find the lemon-grass in general cultivation from the Malay peninsula to Lower Burma on one side and to Canton on the other. In the Malay Peninsula, particularly near Singapore, it is grown on a larger scale for the distillation of oil, but elsewhere mostly for culinary purposes. The earliest record of it from this area is that by Loureiro,‖ who observed it growing in gardens in Canton and Cochin China under the name of Mao-hiam (correct Mao-hsiang, *i.e.*, fragrant Mao). In Mergui it was collected by Griffith "in aquosis" in 1834.

UNCERTAINTY OF THE TAXONOMIC POSITION.—Considering how widely it is distributed over the tropics of both Hemispheres, it is remarkable that the characters and the affinity of this grass have till now remained so obscure. It would indeed be quite unintelligible, but for the fact, already well known to Rumphius, that it flowers so extremely rarely, and on that account has been persistently neglected by collectors. It is true that a clue to it was given in the two specimens from Roxburgh's herbarium and Lambert's garden in the British Museum, but for some reason they remained entirely unnoticed, and such specimens as existed in other herbaria were, in the absence of sufficient

* Schumann & Lauterb., Flora Deutsch-Schutzg. Südsee, vol. i. (1901), p. 173.
† Seemann, Fl. Vit. (1865), p. 320. Horne, A year in Fiji, p. 69.
‡ Balansa in Bull. Soc. Bot. France, vol. xix. (1872), p. 321.
§ Seemann, l.c.
‖ Loureiro, Flor. Cochinch. (1790), p. 646.

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information by the collectors, never connected with the 'lemon-grass.' After the necessarily somewhat lengthy exposition of its history, it will, however, be comparatively easy to establish the systematic position of the grass.

When, soon after the publication of the first edition of the 'Species Plantarum,' the first copy of Rumphius' 'Herbarium Amboinicum' reached Sweden, Linnaeus' pupil, O. Stickman, set to work to identify Rumphius' plants as far as possible with Linnaeus' species, so that they might be added as synonyms. The result was a dissertation by Stickman under the title 'Herbarium Amboinense,' originally published in May, 1754, but reprinted in an augmented form in 'Amoenitates Academicae' (vol. iv., pp. 112–143) in 1759. In this dissertation (p. 19 of the original, p. 130 of the reprint) we find Rumphius' '*Schoenanthum Amboinicum*' for the first time identified with *Andropogon Schoenanthus*, L. Burmann adopted this reduction at once; but Linnaeus may have hesitated, for although he accepted it in the 10th edition of his 'Systema Naturae,' p. 1304 (1759), it is absent from the second edition of the 'Species Plantarum' (1763). It reappeared, however, in the 11th and 13th editions of the Systema (1767 and 1774). Subsequently Lamarck* and Willdenow† followed Linnaeus in assuming the identity of the Malayan Siree with '*Andropogon Schoenanthus*, L.,' but also further confused the conception of the latter by throwing in Rheede's Kodi-pullu and Ramacciam (Lamarck), and some of Klein's and Rottler's specimens from the Southern Peninsula (Willdenow). Hence it is not surprising that Roxburgh,‡ too, relying on Willdenow's 'Species Plantarum,' put down the scented grass of the Coromandel gardens, which he knew to be the Sereh of the Malays, as '*Andropogon Schoenanthus*, L.' Under that name the lemon-grass henceforth appeared very generally, until more recently the transference of the name "*Andropogon Schoenanthus*" to the Rusá grass made it necessary to look out for another name for the 'lemon-grass.' For some time it was sunk in *Andropogon Nardus* (see my observations under that species and under *Cymbopogon flexuosus*); but in 1883 it was definitely recognized as a distinct species by Watt§ and enumerated as '*Andropogon citratus*, DC.' This was a bold assumption, as nobody seemed to know what the plant was that De Candolle had so named, there being neither a description nor the original in existence. Yet, Watt was right. What De Candolle‖ says of '*Andropogon citratus*' is this: "*Andropogon? citratum.* Sub hoc nomine in hortis plurimis occurrit et in nostro etiam servatur gramen nondum florens etiamsi laete vigens, habitu fere *Andropogonis Schoenanthi* sed major et caldarium non requirens, distinctissimum in eo quod folia trita citri odorem grate spirant." As the grass is not mentioned in Broussonet's 'Elenchus Plant. Hort. Monspel.' (1804), and on the other hand is already referred to in 1811 by Roemer and Schultes,¶ who saw it growing in the

* Lamarck, Encycl. vol. i. (1783), p. 375.
† Willdenow, Spec. Plant., vol. iv., part ii. (1806), p 915.
‡ Roxburgh. Fl. Ind., ed. Carey & Wall., vol. i. (1820), p. 278.
§ Dict. Econ. Prod. of India, vol. i. (1883), part iv., p. 4.
‖ De Candolle, Cat. Plant. Monsp. (1813), p. 78.
¶ Roemer and Schultes, Systema, vol. iii. (1817), p. 833.

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aquarium of the Montpellier garden, it was probably introduced there between 1804 and 1811. This was the time when the 'lemon-grass' was in cultivation at Kew and Cambridge, and probably also in other English gardens. These facts, the equivalency of the names 'Lemon-grass' and '*Andropogon citratum*,' and the description of the odour of the Montpellier plant which exactly fits that of 'lemon-grass,' are enough to suggest very strongly that De Candolle's *Andropogon citratus* was actually 'lemon-grass.' He may have had it from England; but not necessarily so; for about the same time a grass was growing in the Jardin des Plantes at Paris under the name of '*Andropogon Nardus*, Pers. Syn. *citriodorum*,' which later writers admit to be the same as De Candolle's *Andropogon citratus*. Desfontaines* (1815) gives Mauritius as the country whence it came. The only Mauritius grass which might be taken for *Andropogon Nardus* is the 'lemon-grass,' which may very well have been in cultivation there at the beginning of the last century, although it is not actually mentioned as coming from there before 1837. Thus De Candolle and Desfontaines may easily have had it from the same source, namely, Mauritius. However this may be, the plant remained in cultivation for some time. It is mentioned in the Turin catalogue of 1821, the Berlin catalogues of 1821 and 1827, the catalogue of the Jardin des Plantes of 1829, etc.; but it does not seem to have flowered anywhere, until in 1833 it did at last flower at Berlin and in 1835 at Breslau. Link,† who records the flowering at Berlin, identified it with Ventenat's figure of '*Andropogon Schoenanthus*' (= *Andropogon pruinosus*, Nees) and reduced it accordingly to *Andropogon Schoenanthus*, L. Nees,‡ who was then Director of the Botanic garden at Breslau, also considered that it agreed with Ventenat's plate of *Andropogon Schoenanthus*, but, as he was well aware that Ventenat's plant could not have been what Linnaeus meant by that name, he took up De Candolle's name, and reduced *Andropogon Schoenanthus*, Vent. (non Linn.), as a synonym to *Andropogon citratus*. He, however, also gave a description of the plant, as it grew at Breslau, and this at once excludes the identity of his and Ventenat's plants, the latter of which he evidently knew only from the figure. This description was buried away in an article in the 'Allgemeine Gartenzeitung' of 1835, pp. 265–267, and became so entirely lost sight of, that except for a citation in Pereira's 'Materia Medica,' I can find no reference to it. Unfortunately, no specimen seems to have been preserved of the Breslau plant. Nees was convinced that his and De Candolle's *Andropogon citratus* were identical. On the other hand, his description also agrees well with the *Andropogon Schoenanthus* of Roxburgh, that is, the 'lemon-grass,' save as regards two characters. Firstly, he says the hermaphrodite (sessile) spikelets are awned, which they only very exceptionally are in lemon-grass; and, secondly, he describes the outer glume of the hermaphrodite spikelet as having 5–6 green nerves in the upper half, whilst I have hardly ever found more than two intracarinal nerves and more often find none at all. However, he may have counted the keels with the nerves, which would very nearly account for his number of nerves,

* Desfontaines, Tabl. École Bot. ed. 2 (1815), p. 15.
† Link, Hort. Berol., vol. ii. (1833), p. 303.
‡ Nees in Allgem. Gartenzeit., vol. iii. (1835), p. 266.

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and as to the awns, Sir Joseph Hooker and I myself have seen a very few perfectly and imperfectly awned spikelets in Griffith's Mergui specimen of 'lemon-grass.' Nees also insists on the striking citron odour of the leaves. In the absence of the originals, no absolute proof is possible that Nees's *Andropogon citratus* was the lemon-grass; but so far as circumstantial evidence is admissible, it appears quite reasonable to assume their identity until proof to the contrary is forthcoming, and consequently to adopt his name. If the occurrence of awns was actually general in the Breslau plant, it might have been a case of reversion to the ancestral form, which no doubt was awned. In corroboration of my view of the identity of Nees's '*Andropogon citratus*,' I may add, that Nees's brother, Theodor Friedrich, has also given a description of '*Andropogon citratus*' in 'Geiger's Pharmaceutische Botanik,' 2nd ed., vol. i., p. 147. This description is shorter, but in some respects is more precise and is thus supplementary to that in the 'Allgemeine Gartenzeitung'; he unhesitatingly identifies it with Fleming's 'lemon-grass.' Further, there is in the Turin herbarium a specimen of lemon-grass, collected by Bertero in Jamaica and received in 1821 by Balbis, who himself named it *Andropogon citratus*. As Balbis had been growing '*Andropogon citratus*, DC.' since 1812 or even before that date, his determination may certainly be accepted as another proof of the identity of 'lemon-grass' and '*Andropogon citratus*.'

Steudel evidently did not know of De Candolle's and Nees's *Andropogon citratus*. Being, however, aware of the fact that Roxburgh's '*Andropogon Schoenanthus*' is not that of Linnaeus, he tried to overcome the difficulty by dropping Linnaeus's name for the Arabian plant which he enumerates as '*Andropogon circinnatus*, Hochst.,'* retaining '*Andropogon Schoenanthus*,' with Roxburgh as author, for the other, that is, the 'lemon-grass'; but he forgot what he had done, and described the plant a second time, on p. 395, as '*Andropogon Roxburghii*, Nees (MSS.),' this time quoting *Andropogon Schoenanthus*, Roxb., as a synonym. *Andropogon Roxburghii*, Nees, is the name used on the distribution labels of Wight's No. 1699, which is undoubtedly 'lemon-grass.'

In 1883, Hackel† described specimens of a grass, termed 'Capim de Cheiro' by the Brazilians, as *Andropogon ceriferus*; four years later he reduced it as a variety to *Andropogon Nardus*, adding a number of West Indian specimens, among them Sintenis' 'Limoncillo' from Porto Rico; but these Brazilian and West Indian specimens are no more than typical 'lemon-grass.'

There are therefore the following names in the field for the lemon-grass:—1. *A. Schoenanthus*, Roxb. non L. (1820); 2. *A. citratus*, DC. (1813), emend. Nees (1835); 3. *A. Roxburghii*, Nees ex Steud. (1855); 4. *A. ceriferus*, Hack. (1883); and 5. *A. Nardus*, var. *ceriferus*, Hack. (1887). For the reasons stated above, I propose to adhere to the specific name *citratus*, so that the grass when transferred to *Cymbopogon* will have to be called *Cymbopogon citratus*.

* Steudel, Syn. Pl. Glum., vol i. (1855), p. 387.
† Hackel, in Mart., Fl. Bras. vol. ii., part ii. (1883), p. 15.

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ORIGIN OF THE LEMON-GRASS.—As the lemon-grass is only known in the cultivated state, the question arises, what is its origin? I am afraid it is yet too soon to give a satisfactory answer. It is true there is not, among the Malayan species of *Cymbopogon*, so far as I know them from the collections at Kew and the British Museum, a single one which suggests itself to my mind as the spontaneous state of the lemon-grass, and Rumphius' statement that it occurs in the wild state in Amboina is, as I have already remarked, open to doubt; but our knowledge of the *Cymbopogons* of the Malayan region is still so imperfect that the possibility of the lemon-grass having originated there is by no means excluded.

The *Cymbopogon* most closely approaching *C. citratus* that I have seen is *Cymbopogon pendulus*, Stapf (*Andropogon pendulus*, Nees ex Steud.), collected by Wallich in Nepal, by Hooker, Kurz and Clarke in the Sikkim Terai, and by Griffith (No. 6763) in "Bengala." No vernacular name is given, there is no information concerning its properties and uses, nor has it ever been connected with the lemon-grass, and to do this in the light of our present knowledge of the history of the latter, would involve a hypothesis bolder than I dare to advance. Another allied form, presumably from the same region, but less like lemon-grass and distinguished therefrom by less hairy racemes, borne on long common peduncles, which are frequently exserted from the supporting sheath, and by smaller and relatively much broader spikelets, was figured as '*Andropogon Schoenanthus*' (qua 'lemon-grass') by Wallich, and referred to *Andropogon Nardus*, var. *exsertus* by Hooker. It was in cultivation in the Calcutta Botanic Garden, and may have been raised from the seeds of a fairly distinct *Andropogon* of the Nardus-series which extends from the Saharanpur Terai to the Garo Hills, and possesses very aromatic, citron-scented leaves. However this may be, neither Wallich's plant nor its presumably wild representative agrees sufficiently with the lemon-grass to suggest the derivation of the latter from either of these species.

OIL AND PLANTATIONS.—I have to add only a few words on the oil prepared from lemon-grass. We have seen that some kind of distillate was prepared from it in the Philippines as early as the beginning of the 17th century. In Europe it first became known about 1717, when Lochner* mentions 'Oleum Siree' as one of the most remarkable oils of the East Indies: "supereminet hoc inter reliqua ex orientali India allata"; but there is nothing to show that it was regularly imported into Europe as an article of commerce until the last quarter of the nineteenth century. Watt† in 1883 gives the export of lemon-oil from Ceylon where the lemon-grass is cultivated by the side of the Citronella grass, although to a very much smaller extent, as 1,500 lbs. Gildemeister and Hoffmann (1903)‡ estimate the production of lemon-oil in the Straits Settlements at 2,000–3,000 lbs. Lemon-grass oil in small quantities and for experimental purposes has also been produced in Java, Tonkin, West Africa, Brazil and the West Indies. It has

* Lochner in Ephem. Acad. Nat. Cur. Cent. v.–vi. (1717), Append., p. 157.
† Dict. Econ. Prod. India, vol. i., part iv. (1883), p. 5.
‡ Gildemeister and Hoffmann, Vol. Oils (1903), p. 289.

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repeatedly been pointed out by Schimmel & Co. in their Semi-annual Reports, that the West Indian, West African and Brazilian products are inferior to good 'East Indian' lemon-grass oil on account of their inferior solubility in alcohol, and their low citral-content. A recent note in the Tropical Agriculturist (August, 1906, p. 141) leads to the same conclusion with regard to the Ceylon lemon-grass oil, samples of which have been tested at the Government Experimental Station at Peradeniya. The explanation of those discrepancies lies evidently in the fact, that the good 'East Indian' lemon-grass oil is the oil of *C. flexuosus*, whilst the 'inferior' kind is the product of *C. citratus*.

8. Cymbopogon Martini, *Stapf.*

(*Andropogon Martini*, Roxb.)

Geranium Grass.—Rusá (*Hind.*).

FOUNDATION OF THE SPECIES.—During the war of 1790–1792 against Tipu Sultan, Claude Martin,* who joined the expedition in 1791 as a Commissioner of Provisions and Aide-de-camp to Lord Cornwallis, collected "in the highlands of Ballaghat" the seeds of a grass which had struck him owing to its excellence as a fodder-plant, as well as on account of its pungent taste and aromatic odour, which was so strong as to impart itself to the milk of the cows which fed on it. From the seeds he raised an abundant crop at Lucknow. He also supplied Roxburgh "with a small stalk, roots and seed." The "small stalk" is not preserved; but Roxburgh grew the grass from the seed in the Calcutta Botanic Garden, and of the specimens thus raised there are two at the British Museum, one from Roxburgh's herbarium, the other from General Hardwicke's collection. The first is named '*Andropogon Martini*' in Roxburgh's own hand, the other, under the same name, bears the date 18th February, 1789. The name did not appear in print until 1814,† whilst the description, although evidently written before 1799, was only published in 1820. The description is rather vague; but so far as it goes, it agrees fairly well with Roxburgh's type in the British Museum, and there would have been no difficulty in exactly identifying Martin's plant, but for the fact that there exists in Roxburgh's collection at Kew, a coloured drawing (No. 1,095) which is also written up as *Andropogon Martini* by Roxburgh himself; this drawing certainly represents another grass. Nees,‡ who seems to have seen the drawing, identified it with the plant distributed by Wight (No. 1,700*c*) under the name "*Andropogon* (*Cymb.*) *caesius*, N.E., *γ. elatior, culmo erecto, firmo*," but the name Nees gives it is "*Andropogon* (*Cymb.*) *Martini*, Roxb., *γ. elatior, culmo firmo erecto*." I am inclined to agree with Nees so far as the identity of the figure with Wight's No. 1,700*c* is concerned; but both names are certainly misapplied, the plant in question being actually *C. coloratus*, a member of the '*Nardus*' group (*see* p. 321). There is also another and very similar coloured drawing in Royle's collection

* Roxburgh, Fl. Ind., ed. Carey & Wall., vol. i. (1820), p. 280.
† Roxburgh, Hort. Beng. (1814), p. 7.
‡ Nees in Meyen, Obs. Bot. (Nov. Act. Leop. Carol. Nat. Cur. vol. xix., suppl. ii. 1843), p. 190.

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at Kew, written up as *Andropogon Martini* by Royle. This, apart from the usual exactness of Roxburgh's drawings, precludes the assumption that the Roxburghian figure is merely an instance of bad draughtsmanship. How the confusion came about I cannot say; but under the circumstances it is evidently only reasonable to connect the name *Andropogon Martini* with the Roxburghian type in the British Museum rather than with the drawing.

The exact locality where Martin gathered the plant is not known, "Ballaghat" in this case meaning merely the table-land "above the Ghats." Yet the fact that the military operations of 1791 and 1792 were confined to the country around and between Bangalore and Seringapatam, fixes the locality within narrow limits.

When the Rusá-oil grass of Nimar became known in 1824, Wallich* suggested that it was *Andropogon Martini*, and this has ever since been generally admitted. He, however, also assumed the identity of *Andropogon Martini* with *Andropogon Jwarancusa*, and in this he was no doubt wrong. Roxburgh's type must have been cut from an unusually robust plant. The culm is 6 mm. in diam.; the sheaths are up to 8 mm. wide, whilst the incomplete leaves are about 37 cm. long, and where broken off, 12 mm. wide, the maximum width near the base being 15 mm. The inflorescence is over 30 cm. long. I have seen no specimen exactly matching the type so far as dimensions are concerned; but one collected by Duthie at Asirgarh Fort, the locus classicus—as we shall presently see—of the Rusá-oil plant, is in every other respect a perfect counterpart of it, so that there can be no doubt as to the identity of *Andropogon Martini* and the Rusá-oil plant.

COMPLICATION OF THE SYNONYMY.—In 1837, Royle referred to the fragrant Nimar grass in his essay on the 'Antiquity of Hindoo Medicine.' As Hatchett had tried to prove that it was the 'Spikenard' of the ancients, so now Royle in an elaborate paragraph endeavoured to demonstrate that the grass was the classical *Calamus aromaticus*, and therefore proposed for it the name *Andropogon Calamus aromaticus*. Although it seems to me highly probable thot the ancient *Calamus aromaticus* was one of the aromatic Cymbopogons which form the subject of this paper, I doubt if it was the Rusá grass. This, however, is not the place to examine the question. Royle gave no technical description of his *Andropogon Calamus aromaticus*, though he figured it extremely well in his 'Illustrations of the Botany of the Himalayan Mountains' (1840), tab. 97, fig. 3. Here (p. 425) he defined the area of the grass as extending "north as far as Delhi, and south to between the Godavery and Nagpore," which is somewhat surprising, as he must have known it from the outer hills of the Himalayas, particularly from the neighbourhood of Saharanpur and Simla. In fact, it had already been collected in Nepal (probably the Nepal terai) by Wallich as early as 1820, and described by Trinius† from Wallich's specimens as *Andropogon pachnodes* in 1833, whilst an excellent figure by the same author‡ followed in 1836. The

* Wallich in Trans. Med. & Phys. Soc. Calcutta, vol. i. (1825), p. 368.
† Trinius, Andropog. in Mém. Ac. Pétersb. sér. 6, vol. ii. (1833), p. 284.
‡ Trinius, Spec. Gram. Icon. (1836), tab. 327.

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synonymy was further complicated by G. C. Nees, who named some specimens in Wight's herbarium (No. 1702) *Andropogon nardoides*, and in 1841 published a description of *Andropogon nardoides*,* at the same time reducing Trinius's *Andropogon pachnodes* to it as a synonym. There were thus four names in the field, more or less definitely connected with the fragrant Nimar grass: *Andropogon Martini* (1820), *A. pachnodes* (1833), *A. Calamus aromaticus* (1840), and *A. nardoides* (1841). They were all set aside, when in 1862 Munro† pointed out that the 'type' of *Andropogon Schoenanthus* in Linnaeus's herbarium was Roxburgh's *Andropogon Martini*. I have in another place shown the value of that 'type' and explained how little it has to do with the Rusá-grass. However, the fact was accepted as implying that Linnaeus had this grass in view when establishing his *Andropogon Schoenanthus*, and consequently Flückiger and Hanbury‡ (in 1874) put '*Andropogon Schoenanthus*, L.,' down as the source of the Rusá-oil, an assumption which has since then remained unchallenged. From what I have said, it is, however, perfectly clear that the Rusá-grass is actually identical with *Andropogon Martini* of Roxburgh, and has to stand as such, or, if transferred, to *Cymbopogon*, as *C. Martini*.

AREA AND VARIATION.—The area of *C. Martini* extends in India from the Rajmahal Hills on the bend of the Ganges to the Afghan frontier, and from the subtropical zone of the Himalaya to about 12° N., leaving out the desert and steppe region of the Panjab, the outer slopes of the Western Ghats, and, as would appear, a great portion of the Northern Carnatic. From the collectors' and writers' notes it appears to be locally very common, and a conspicuous feature, particularly in the late autumn when the panicles change colour and impart their rich brown-red tints to the hill sides. So striking is this colour effect that one is tempted to suggest that the two commonest vernacular names for the grass 'rusa' with its numerous variations, and 'mirchia gand,' take their origin from it; 'rusa' being possibly derived from 'ruh,' Sanscrit for "to be red," and 'mirchia gand,' having reference at the same time to the colour, the red of mirch (*Capsicum*) and to the scent (gandha). Within the greater part of its area the grass, although very uniform in the structure of the spikelets and the peculiarly soft and delicate texture of the leaves, is remarkably variable in stature and in the dimensions of the leaves. From less than 1 m. it grows to a size which is described as 'gigantic,' whilst the leaf-blades range from ·25 to probably quite 1 m. in length and from 8 (in extreme cases 5) mm. to 30 mm. in width. One of the most characteristic features of the leaf of *C. Martini* is that the greatest width is generally near the base of the blade, which is rounded off and suddenly constricted and frequently clasps the culm. This form is for example illustrated in Trinius's and Royle's figures and might be called the '*pachnodes*' type. In Roxburgh's type specimen the shape of the blade is somewhat different in so far as the width is almost the same for a very considerable distance from the base upwards, whilst the base itself is less constricted and not stem-clasping. The same

* Nees, Fl. Afr. Austr. (1841), p. 116.
† Munro in Journ. Linn. Soc. vol. vi. (1862), p. 52.
‡ Flückiger and Hanbury, Pharmacographia (1874), p. 660.

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type is repeated on a smaller scale in Duthie's specimen from Asirgarh Fort and in Wight's No. 1702, and on a still smaller scale in the slender form which is prevalent in the southern and south-western part of the area. How far those differences are due to the conditions of the habitat can only be decided in the field; but they certainly suggest edaphic influences, such as the conditions of soil and water supply. According to Malcolmson, the Rusá-grass, in the Deccan, affects particularly the trap, more or less avoiding the granite, so much so that he was able to trace the green-stone dykes across the granite by the luxuriance of the grass, whilst Fernandez writes that it grows on the hill sides as well as on plateau land and in periodically flooded plains, all of which indeed implies a considerable diversity of local conditions. Still it is noteworthy that in the ample material at my disposal the '*pachnodes*' type is not represented from any point south of 18° N.

EARLY RECORDS OF RUSÁ OIL AND RUSÁ GRASS.—It was Dr. N. Maxwell,* Assistant Surgeon at Asirgarh Fort in Nimar, who in 1824 in a letter to the Medical Board of the East India Company called attention to a fragrant grass which was "found in great abundance on the sides of the Hill fort, as well as all over Malwah. From it," he says, "is extracted a highly pungent essential oil (when in its pure state), which I can from experience confidently recommend as of the highest benefit, when applied by friction in rheumatic affections," and further, that "it is prepared by a very rude process under Jaum Ghaut, in the vicinity of the station of Mundlaisir." The specimens which he sent with his letter were submitted to Wallich, who, in his reply to the Medical Board, reported as stated above, adding that he himself had found the plant abundant in Nepal. In the following year, J. Forsyth,† who had been directed to investigate the matter on the spot, presented a paper to the Medical and Physical Society of Calcutta, in which he gives a detailed account of the preparation and the sale of the oil and the conditions under which the grass grew and was gathered. He also gives 'Roosa-ka-Tel" as the native name of the oil. Of the grass, he reports that it "is met with in frequent distinct patches in the jungle throughout the province of Nemaur, but in greatest abundance along the foot of the Vindhya range, near Nalcha, at which two places‡ only I believe it is prepared, at least to any amount. About the latter end of August, it begins to bud, and continues to flower in tolerable vigour till the end of October, during which period alone it gives out the oil in sufficient quantity to cover the expense and trouble of its preparation, as after this it speedily dries up, and what little oil it does yield is extremely acrid, and unfit for use. . . . The oil is obtained from the grass by distillation . . . the plant is cut across where it begins to give out its flower, and bound up into small bundles. . . ." A few years later (in 1830), Charles Hatchett, F.R.S., a prominent chemist, received a sample of oil from a Mr. Samuel Swinton, who had been in the East India Company's service for many years and had resided for some time in Malwa. Hatchett made the grass which

* Maxwell in Trans. Med. & Phys. Soc. Calcutta, vol. i. (1825), pp. 367–368,
† Forsyth in Trans. Med. & Phys. Soc. Calcutta, vol. iii. (1827), pp. 213–218.
‡ Viz., Jaum and Nalcha.

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yielded this oil the subject of a somewhat confused paper, entitled 'Spikenard of the Ancients' (1836), which I do not intend to discuss here, confining myself to Swinton's information embodied therein. Swinton, like Maxwell, first became acquainted with the oil (which he says is called "Rhonsee-ke-Tell" by the natives) as an effective remedy in severe attacks of rheumatism. He also stated "that although the plants are found in other parts of India as well as in Malvah, yet those which grow about the Jaum Ghaut are preferred, and gathered in the month of October, when the seeds forming the ears or spikes have become fully ripe. At that season, however, in the places where this gigantic grass is produced, the jungle fever is so prevalent that the peasantry who collect it will not expose their health . . . unless tempted by very high remuneration. . . ." Hatchett further adds, "Mr. Swinton was informed by them (the principal natives) that it has been prepared in and about Malvah from time immemorial, at first probably by the Parsees, although at present it is entirely in the hands of the Borahs, a very commercial people, forming a sect of Moslems, whose chief resides at Surat. The oil is obtained from the spikes which, when ripe, are cut with a portion of the stem about one foot in length, and are then subjected to distillation. Only a small comparative quantity of the oil is consumed by the natives, the greater part being now, as was the case in very remote times (according to tradition), sent as an article of commerce to Arabia." Finally it is stated that "the odour of the plant is so powerful, that although camels will eat almost any vegetable, yet they will not browse on this. . . ." Neither the production nor the export of the oil can, however, have reached any considerable dimensions, as Jacquemont, who, in the spring of 1832, visited Nalcha and Jaum, and gave a very full account of Malwa, does not mention the grass or the oil. The grass, it is true, might have escaped him, as at that season it must have all been dried up.

How far there is any truth in the tradition that oil has been distilled from the Rusá grass 'from time immemorial,' we do not know. The authors of the Pharmacographia Indica (vol. iii., p. 558) merely suggest that "the industry commenced in the 18th century whilst Khandeish was in a flourishing condition under its Mahometan rulers." However this may be, there is sufficient evidence that the grass must have been known to the Aryan peoples of India for a very long time. 'Rohisha,' the Sanskrit equivalent of the Hindi 'Rusá,' occurs in Susruta and in some of the earliest Sanskrit dictionaries. Another name in Sanskrit, evidently from the same root, is 'Rósem.' Variants of these terms are generally recognised vernacular names in the Hindi, Gujerati, and Mahrati dialects. Curiously enough, the name does not appear in the earlier Persian Pharmacopœias, the first record of it 'Rús' being apparently in the Makhzan-el-Adwiyah† (1771). According to the authors of the Pharmacographia (vol. iii., p. 557), *C. Martini* is also "the Bhustrina or Bhutrina 'earth grass' of the Raja Nighanta," and among the synonyms, which it bears, we may mention Gandha-Khéda and Gandha-trina 'odorous grass,' Su-rasa

* Royle, Antiquity of Hindoo Medicine (1837), pp. 31–34, 82–83, 143.
† *See* Dymock, Veget. Mat. Med. Western India, ed. 2 (1885), p. 851.

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'well-flavoured,' and Su-gandha 'having an agreeable odour.'" 'Bhustrina' is also mentioned in Susruta. Roxburgh* identified it with his '*Andropogon Schoenanthus*,' that is 'lemon-grass,' (*C. citratus*), which, having regard to the origin and history of that species can hardly be correct. The same applies to the other Sanscrit name which he refers to the 'lemon-grass,' namely 'Malatrinu Kung,' or rather Mālā-trini (Stolz) or Mala-trinaka (Hessler), another term used in Susruta and interpreted as connoting '*Andropogon Schoenanthus*.' Of other vernacular names which have been connected with *C. Martini*, I would mention here only two, 'Mirchia-gandh' and 'Gandh-bel.' 'Mirchia-gandh' has already been alluded to. Its derivation from 'Mirch'=*Capsicum annuum* or *Piper nigrum* and 'gandha'= odour, perfume, is obvious. There is not much in the grass to suggest pepper, but the bright colour of the fruiting panicles might well be compared to the red of chillies. If this is the meaning, the name cannot, of course, be old. It occurs, however, already in the Talif Sherif,† where it is mentioned in connection with 'Gundheel' as something kindred. 'Gandh-bel' (given as 'Gundbeyl' in Gladwin's translation) occurs as a Hindi synonym of 'Izkhir' as early as the middle of the 15th century in the Ulfaz Udwiyah,‡ again in the Talif Sherif† ('Gundheel' in Playfair's translation) and in the Makhzan-el-Adwiyah‡ (1771, 'Gundbel' and 'Gundhiz' in the Pharmacographia Indica). By this time 'Izkhir' seems to have become a nomen genericum with the Arab and Persian physicians in India, and similarly 'Gandh-bel' may have been applied to several of the fragrant Andropogons of Northern India, including ultimately also the 'lemon-grass,' for which Roxburgh, Fleming, and Ainslie found it in use at the beginning of the last century. The derivation of 'Gandh-bel' and its variants is, save as regards the appellation 'Gandh' (gandha, *Sansc.*=odour, perfume), still obscure. 'Gandhi' by itself is, according to Drummond,‖ used in the Panjab for *C. Schoenanthus* (Khavi), and, according to Duthie,§ in the north-west part of that province for *C. Martini*¶.

PRESENT EXTENT OF RUSÁ-OIL INDUSTRY. MOTIA AND SUFIA.—At present the principal places of production of Rusá-oil are Pimpalner, Akrani, Nandurbar, Shahada, and Talada, all in Khandeish; but it is also prepared in the Nagpur, Sagar, Jubbulpur and Karnul districts, and at Ajmere (Rajputana). Considering the wide distribution of the Rusá-grass, it is surprising how limited the area of its exploitation is. The principal reason is no doubt the quite recent development of the demand for the oil. In 1879 the total production was estimated at 3600 kilos, or 7934 lbs. Since then it has risen enormously and may at present amount to about 20,000 kilos, or 44,080 lbs.** There may, however, over certain areas, be differences in the constitution of the grass due to

* Roxburgh, Fl. Ind., ed. Carey & Wall., vol. i. (1820), p. 278.
† Taleef Sherif, trans. Playfair, p. 129.
‡ Ulfaz Udwiyah, transl. Gladwin.
§ *See* Dymock, Veg. Mat. Med. Western India, ed. 2 (1885), p. 851.
‖ *See* Duthie, Fodd. Grass. N.W. Ind. (1888), p. 36.
¶ Duthie, l.c.
** Gildemeister & Hoffmann, Vol. Oils, (1903), p. 285.

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racial variation or to conditions of the station resulting either in a reduction of the amount of oil obtainable or in such a modification of its quality as to render it unfit for the market. As an instance, I may mention that Madden*, a very careful observer, remarks that the "seeds (of *C. Martini* from Kumaon) seem different from those of the Neemar oil-grass, and have neither the same pungent odour or oily feel." Similarly the predilection of cattle and other animals for it in some districts, and their aversion to it in others may be accounted for by the existence of some such variation, unless indeed the observations on this point have been made indiscriminately from the young and the old grass. For there seems to be little doubt that the amount and the constitution of the oil in the plant undergo certain changes as the grass passes through its yearly cycle of development. Forsyth† has already remarked that the grass has to be cut during a certain period, to cover the expense and trouble of the preparation of the oil, as the amount obtainable subsequently diminishes, while the quality deteriorates at the same time. The distinction between the two kinds of Rusá-oil, viz., 'Motia' (Motiya) and 'Sufia' (Sofiya), which the distillers of Khandeish and the neighbouring districts recognise, apparently depends on similar conditions, although the accounts concerning them are to some extent conflicting. The authors of the Pharmacographia Indica (vol. iii., p. 558) say: "The oil distillers in Khandesh call the grass *Motiya* when the inflorescence is young and of a bluish white colour; after it has ripened and become red, it is called *Sonfiya*. The oil obtained from it in the first condition has a more delicate odour than that obtained from the ripened grass. The *Motiya* oil is usually mixed with the second kind, which by itself would not fetch a good price in the European market." On the other hand, Mr. E. G. Fernandez reports in a letter to Kew: "The *motiá* species (or variety) is usually confined to the higher hill slopes, while the *sufiá* grass is more common in the plains and on plateau-land in the hills, but they are not unfrequently found growing together. The *sufiá* is much more strongly scented, but the odour of the *motiá* is preferred, and this latter commands double the price of the former. It is chiefly or exclusively the *motiá* that is exported to Turkey for mixing with otto of roses." The samples of both forms supplied by Mr. Fernandez do not show any morphological differences, and as to age, some of the *motiá* samples are in a more advanced stage than the *sufiá*.

9. Cymbopogon caesius, *Stapf.*

(*Andropogon caesius*, Nees, in part.)

Kāmātci-(Kāmākshi-) grass (Tamil).

CHARACTER OF THE GRASS.—I have already pointed out that the Rusá-grass extends over the Deccan as far south as 12° N., with the exception of the western Ghauts and a portion of the Carnatic, and further, that in the southern part of its area it is represented mainly by a narrow-leafed state. In the Carnatic, it

* Madden, in Journ. As. Soc. Beng. vol. xvii. part i. (1848), p. 439.
† Forsyth, in Trans. Med. and Phys. Soc. Calcutta, vol. iii. (1827), p. 215.

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is replaced by a closely allied form with more slender and more branched culms, usually from ⅔–1 m. high, with narrower, thinner, often almost flaccid and very glaucous leaves and with generally smaller panicles, which seem to retain their glaucous colour, or merely turn strawcolour when mature. The structure of the spikelets is, however, that of *C. Martini*, and so closely does the Carnatic grass in some instances approach the narrow-leafed state of *C. Martini*, that there would be no difficulty in constructing a chain of intermediate stages, linking together both forms as completely as possible. Those transition forms are, however, so far as I can see, confined to the border districts where the two grasses meet, elsewhere they are sufficiently distinct.

EARLY HISTORY.—The oldest specimens of the Carnatic grass on record are a specimen in the Plukenet herbarium at the British Museum and several in the Du Bois herbarium at Oxford, all of them collected near Madras at the end of the 17th or in the early years of the 18th century; but it is very probable that a passage in a letter by Herbert de Jager* to Rumphius, dated 6th July, 1683, also refers to it. Contesting the view of Bontius and others that the 'Sereh' of the Malays is identical with the '*Schoenanthum*' of the herbalists and in support of his argument, he says: "I have become familiar with the true and genuine *Schoenanthum* in Persia, and particularly on the coast of Coromandel, where I have traversed whole fields of that grass, which is about 2½ to 3 feet high and the scent of which may be noticed from afar, particularly during the night when dew falls or in day-time when it rains, whilst in sunshine and fine weather not much odour is perceptible. In Golconda this *Schoenanthum* ground into powder is used for washing the hands on account of the sweet scent it imparts to the water; though the odour does not persist when the hands get dry." Neglecting for the present the question as to what the '*Schoenanthum*' powder of Golconda was, there can be little doubt that the fragrant Coromandel grass, of which there were whole fields to traverse, was the Kāmāṭci-pillu of the Tamils. Of this name we hear for the first time in 'Samuel Browne's Seventh Book of East Indian Plants,' edited and commented on by Petiver† (1702). The plants which form the subject of the paper were collected "between the 15th and 20th June, A.D. 1696, in the ways between Fort St. George and Trippetee, which is about 70 miles off." One of them was 'Comachee pillee,' and of it Browne says: "This is Schoenanth, which the natives here have not in great Esteem; sometimes in the Moors' Camps, the Horses, Camels, and Oxen which carry burthens eat nothing else; it is generally 2 or 3 feet high here about (but near Color in reech soyl, I have seen it 8 feet high) [this gigantic grass is no doubt *C. Martini*] and thick as a Quill or small Reed; It's sometimes by the natives put into their Decoctions for Fevers, and with us is deservedly of more esteem." Petiver‡ identified the 'Comachee pillee' with Plukenet's '*Gramen Dactylon Maderaspatense*' figured on plate 119, fig. 2 of his Almagesta (1691), the type of which is in Plukenet's herbarium—it is the

* Herbert de Jager in Valentini, Hist. Simpl. (1732), p. 392.

† In Petiver, Mr. Samuel Browne, his Seventh Book of East India Plants in Phil. Trans. xxiii. (1702), p. 1252.

‡ Petiver, l.c., p. 1251.

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specimen to which I have referred above. That type is an exact counterpart of certain specimens in the herbarium of Ch. Du Bois, who had received them from Madras, partly from his brother Daniel and partly from Dr. Bulkley, the latter having put them down as 'Caumachipille pille,' *i.e.*, 'Kāmāṭči pillu.' Petiver also enumerated the same grass, as a specimen in the Du Bois Herbarium proves, as "*Schoenanthus Madraspatanus panicula minore, spicis villosis geminis*" in his 'Museum,' No. 576 (1695), and communicated a sample of it to Scheuchzer, who in his 'Agrostographia,' p. 98 (1719), gave a more detailed account of it under Petiver's phrase.

CONFUSION WITH 'ANDROPOGON SCHOENANTHUS, L.'—Petiver, in his commentary on Samuel Browne's plants, made the mistake of identifying the Kāmāṭci pillu with the '*Schoenanthum*' of the herbalists, and even upbraided Plukenet for figuring "this plant twice over . . . his first figure is much truer than the last," although it is quite clear that the 'first figure' (Almag. tab. 119, fig. 2) represents the Kāmāṭči pillu, whilst the other (l. c. tab. 190, fig. 1) illustrates, though badly, the '*Schoenanthum*.' I mention this mainly to show that, even in pre-Linnean times, the tendency had manifested itself of identifying other aromatic grasses with the one which had become so familiar to the botanists of those early days. We have seen that Linnaeus fell into the same error, and we need not be surprised that when, towards the end of the 18th century, Koenig and his pupils Rottler and Klein gathered the grass again, they too put it down as '*Andropogon Schoenanthus*.' Rottler and Klein supplied Willdenow with specimens of this grass, and Willdenow appears to have written out his extended description of '*Andropogon Schoenanthus*,'* partly at least, from these specimens. To show how confused the taxonomy of these grasses had by this time become, I may mention that there are three sheets in his herbarium under the name. Sheet 1 contains a panicle and leaves of the true 'Lemon-grass' or Sereh, a young panicle with some of the upper leaves of the officinal '*Schoenanthum*' (Camel's hay) and a small inflorescence of *C. coloratus*. Sheets 2 and 3 are the Kāmāṭči grass. Sheet 1 is initialled by Willdenow, and Sheet 3 is accompanied by a label with the name '*Andropogon Schoenanthus*' in his handwriting. Under the circumstances it is not surprising that the Indian botanists of the time, who depended on a few books and relied for the comparison of their species with those of extra-Indian floras on the support of their European colleagues, formed equally confused ideas concerning these fragrant grasses. Thus Ainslie, in his 'Materia Medica'† (1813), refers 'Comachee pilloo' to '*Andropogon Schoenanthus*,' and adds to it as synonyms vernaculars which in reality belong to the 'Lemon-grass' and to the 'Camel's hay.' Wight, who collected the grass repeatedly, distributed some of his specimens (No. 1806) under the same name. Others he submitted to Nees, who was then planning a monograph of the Indian *Glumaceae*, which, however, was never completed. Nees named Wight's grasses, which were subsequently distributed with his determinations, and described them as opportunity offered.

* Willdenow, Spec. Plant. vol. iv., part ii. (1806), p. 915.
† Ainslie, Mat. Med. (1813), p. 75.

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FOUNDATION OF THE SPECIES.—Among the grasses thus distributed was the Kāmāṭči pillu (No. 1700*b*). It was named by Nees '*Andropogon caesius*, *β*.' Unfortunately, Nos. 1700, 1700*c*, and 1700*d* were also distributed under that name. No. 1700 was *Andropogon pumilus*, Roxb., No. 1700*c* *Cymbopogon coloratus*, and No. 1700*d* a diseased state of *C. coloratus*. The distribution of *Andropogon pumilus* as *Andropogon caesius* was obviously a mere accident, as it is evident from the original specimen in Wight's own herbarium that Nees really meant to apply the name *Andropogon caesius* to No. 1700*a*, which is the same as No. 1700*b*, but is a very weak, (shade?) form. The description of *Andropogon caesius* appeared in Hooker & Arnott's 'Botany of Beechey's Voyage'* a few years later. Nos. 1700 (recte 1700*a*), 1700*b*, and 1700*c* of Nees' distribution are quoted, and it is obvious that the description was drawn up from all three indiscriminately. To make matters worse, Nees referred to this composite species specimens collected by Millett and Vachell near Macao, which are neither identical with Nos. 1700*a* and 1700*b*, nor with 1700*c*, but represent what is generally accepted as *Andropogon hamatulus* or *Andropogon Nardus* var. *hamatulus*. Nor was this all. In 1843, Nees revised his determinations of those grasses in Meyen's 'Beiträge zur Botanik' (p. 190), and reduced *Andropogon caesius* to *Andropogon Martini*, quoting Wight, No. 1700 and No. 1806 (the latter = Kāmāṭči), under *Andropogon Martini*; Nos. 1700*a* and 1700*b* (both = Kāmāṭči) under *Andropogon Martini*, *α* and *β* respectively; and No. 1700*c* (*C. coloratus*) under *Andropogon Martini*, *γ*. He further referred Millett's and Vachell's Chinese specimens to the latter, of which at least Vachell's—I have not seen the other—is *Andropogon hamatulus*, and he cited does not persist when [illegible] drawing, No. 1095, which evidently present the question as to what the 'Scass therefore remains Golconda was, there can be little doubt that the [illegible]ogon caesius, grass, of which there were whole fields to traver Nos. 1700*a* Kāmāṭči-pillu of the Tamils. Of this name we hear for the time in 'Samuel Browne's Seventh Book of East Indian P[illegible] edited and commented on by Petiver† (1702). The plants which form the subject of the paper were collected "between the 1[illegible] and 20th June, A.D. 1696, in the ways between Fort St. George and Trippetee, which is about 70 miles off." One of them was 'Comachee pillee,' and of it Browne says: "This is Schoenanth, which the natives here have not in great Esteem; sometimes in the Moors' Camps, the Horses, Camels, and Oxen which carry burthens eat nothing else; it is generally 2 or 3 feet high here about (but near Color in reech soyl, I have seen it 8 feet high) [this gigantic grass is no doubt *C. Martini*] and thick as a Quill or small Reed; It's sometimes by the natives put into their Decoctions for Fevers, and with us is deservedly of more esteem." Petiver‡ identified the 'Comachee pillee' with Plukenet's '*Gramen Dactylon Maderaspatense*' figured on plate 119, fig. 2 of his Almagesta (1691), the type of which is in Plukenet's herbarium—it is the

* Herbert de Jager in Valentini, Hist. Simpl. (1732), p. 392.

† In Petiver, Mr. Samuel Browne, his Seventh Book of East India Plants in Phil. Trans. xxiii. (1702), p. 1252.

‡ Petiver, l.c., p. 1251.

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in April in a thoroughly dry condition yielded 0·711 per cent. of oil, the differences in the yield being attributed to the first lot being fresh, whilst the other was dry. No analysis of the oil has yet been made.

10. Cymbopogon polyneuros, *Stapf.*

(*Andropogon polyneuros*, Steud.)

Just as *C. Martini* is replaced in the south-east of the Deccan Peninsula by *C. caesius*, so another species takes its place in the south-west. This species, *C. polyneuros*, is, however, much better defined than *C. caesius*. It is a moderately robust grass with a tendency to copious branching from the collar so as to form dense tufts of culms, with somewhat persistent, narrow, basal sheaths, rather fat, smooth blades with a rounded base, more or less glaucous beneath and often suffused with purple along the margin, and with short, contracted, variegated panicles, the herbaceous sheaths being usually deep brown-green with a narrow scarious margin, the spikelets being green in the lower part, and more or less blackish-purple in the upper. It was first distributed by Wight (No. 1705) under the name *Andropogon versicolor*, N.E., a name chosen no doubt in allusion to the variegation of the inflorescence. Nees never published a description of it. On the other hand, Steudel has, in his 'Synopsis Plantarum Graminearum' (1855), (p. 388), an '*Andropogon versicolor*, Nees MSS.,' under which he quotes '*A. Schoenanthus*, Wall. Cat. n. 8794L.' Wallich's 'Cat. n. 8794L.' is in Wallich's own herbarium identical with n. 8794K., which Steudel (l.c.) cites under *Andropogon clandestinus*, Nees. Steudel's description of *Andropogon versicolor* agrees neither with Wight's No. 1705 issued as '*Andropogon versicolor*, N.E.,' nor with Wallich's n. 8794L. It is not clear what the plant, which Steudel had in mind, was; it cannot well have been Wight's '*Andropogon versicolor*, N.E.' Wight does not indicate the locality where his No. 1705 was collected beyond the general note "Peninsula Ind. Orientalis." It agrees absolutely, however, with a grass which has frequently been collected in the Nilgiris, among others by Hohenacker who distributed it as "933, *Andropogon* (*Cymbopogon*) *nardoides β. minor N. ab E.*"; this was made by Steudel* the type of his *Andropogon polyneuros*. That name being perfectly unambiguous, its specific component will have to be retained for the Nilgiri grass in question in preference to *versicolor*, although the latter has very generally been applied to it. Outside the Nilgiris, *C. polyneuros* has so far only been observed in Ceylon where it is, particularly at higher elevations (up to 1,500 m.), a locally common plant. Thwaites† has already called attention to the "rather agreeable aromatic odour" of the inflorescences of this species, adding "that the essential oil appears to be situated principally at the base of the spikelets." According to a note in the 'Tropical Agriculturist' for 1901 (p. 873), the odour of the crushed leaves resembles that of fennel or anise. There it is also stated that the grass

* Steudel, Syn. Pl. Glum. pars. i. (1855), p. 385.
† Thwaites, Enum. Pl. Zeyl. (1864), p. 367.

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(which was identified by Trimen as *A. Schoenanthus*, var. *versicolor*) is particularly common in the Island of Delft in Adam's Strait, and has, under the name 'Delft grass,' the reputation of being a good fodder for horses. I have seen no specimens from that locality.

In 1902, a volatile oil was prepared from a sample of the grass collected on the hills about Ootacamund by Mr. Proudlock. The average yield is given as 0·25 per cent.; but so far no analysis seems to have been made of it.

11. Vetiveria zizanioides, *Stapf.*

(*Andropogon muricatus*, Retz.)

Khas Khas (Hind. ?)—Vetiver (Tamil).

EARLY HISTORY.—If we admit certain deductions of the Sanscritists—and there is no objection to them from the botanist's point of view—this grass, best known as 'Khas Khas' or 'Vetiver,' must have been popular with the peoples of Northern India for a very long time. W. Jones,* as long ago as 1795, identified the *Usira* of Kálidása with 'Khas Khas,' and Hessler† did the same in his translation of the Ayurvedas, whilst among the more recent interpreters of Sanscrit plant-names Dutt‡ has come to the same conclusion. Other Sanscrit names which have been interpreted in the same sense are *Virana*, *Lámajjaka* (or *Lamaja*) and *Bálá*. According to the 'Pharmacographia Indica' (vol. iii., p. 571), "In Vedic times the ancient Hindus were instructed to build their houses in a place where the *Virana* and *Kusa* (*Desmostachya bipinnata*, Stapf) were abundant." *Lámajjaka* is, in the same work (l.c., p. 562), referred to 'Camel's Hay' (*C. Schoenanthus*), but the synonyms 'Dirgha-mulaka' (long-rooted) and 'Jalasáya' (aquatic) with which *Lámajjaka* is connected in the Nighandas, are much more descriptive of 'Khas Khas,' and Heyne's§ and Elliot's‖ interpretation of the term as connoting the latter is therefore more plausible. Hessler also renders the *Bálá* of Suśruta with *Andropogon muricatus*. According to Dutt¶ it stands for *Pavonia odorata*, another plant whose aromatic roots are frequently used in Hindu medicine. But the fact that *Bálá* in Hindi actually also denotes the roots of 'Khas Khas' and that the Bengali, Gujerati and Mahrati synonyms *Válá* and *Való* are applied in the same sense, supports Hessler's identification. In proof of the assumption that 'Khas Khas' was an article of some importance long ago, the authors of the 'Pharmacographia Indica' (vol. iii., p. 572) also refer to the discovery of some copper plates in the village of Basáhi in the district of Etawah, south-east of Agra, it being stated that on these copper plates, which are dated A.D. 1103 and 1174, the grass is mentioned among the articles subject to royalties. The actual term used is 'turushka-danda,' which

* Jones in Asiat. Research. vol. iv. (1795), p. 306.
† Hessler, Suśruta's Ayurvedas, vol. iii. (1850), p. 174.
‡ Dutt, Mat. Med. Hind. (1900), p. 321.
§ Heyne, Tracts Hist. Stat. India (1814), p. 130.
‖ Elliot, Fl. Andh. (1859), p. 106.
¶ Dutt, l.c., p. 293.

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Babu Rájendrala'la Mitra* interprets as meaning "aromatic reed" (turushka = aromatic substance, danda = stick), and hence also 'Khas Khas.' The latter term, now so commonly used, is supposed to be of Persian origin, but this appears to me very doubtful. It is mentioned in the Makhzan-el-Adwiyah† as a kind of 'Izkhir' used in India, also known as 'Izkhir-i-Jami,' (Izkhir-i-Ajami, foreign Izkhir), and called by the Persians 'bikh-i-wála' (wálá root).

The 'Khas Khas' was long ago equally well known to the Dravidic peoples of the South. Rheede‡ described and figured the grass under the Malayalim name *Ramacciam*, which is still in use in Travancore (*Ramach-cham*, Moodeen Sherif; *Ramaccam*, Stolz). He states that the roots (but not the leaves) are fragrant and sold in the bazars for medicinal purposes to prepare lotions, infusions, and decoctions. It is, he remarks, very common throughout Malabar and diligently cultivated by the natives, who propagate it by dividing the tufts and planting them in loose soil. He further observes that the best *Ramacciam* grows near Tutocorim, the port which in our own day is still the principal place of export of the roots of 'Khas Khas' or 'Vetiver.' Rheede's figure represents a leaf-tuft with the leaf-tops cut off. Although somewhat crude, it is perfectly characteristic, and it is difficult to understand how the 'Ramacciam' of the 'Hortus Malabaricus' could ever have passed—as it so frequently has done—for the 'lemon-grass.' Hermann§ (1672–1677) also found the roots in similar use at Colombo in Ceylon, where they were known as '*Lumbutschi-veru* (radix odorata)' and the grass itself as '*Saewaendara*,' which name has survived to the present day. About 25 years later (in 1700) Dr. Bulkley sent it to Ch. Du Bois from Madras under the Tamil name 'Vettyveer' (= Vetiver), the vernacular name by which the grass is best known in Europe. Petiver‖ also received specimens of it from Samuel Browne of Madras at about the same time and announced them in his 'Museum' as "*Gramen Madraspatanum majus cujus locustae spinulis eleganter armatae sunt.*" Some of them he sent to Scheuchzer¶, who from them drew up one of those classic descriptions which for completeness and accuracy remained long unequalled in agrostological literature.

FOUNDATION OF THE SPECIES. SYNONYMY.—No notice was taken of Scheuchzer's description or of Petiver's and Du Bois's specimens, and when Linnaeus, about 1770,** received the grass from Koenig he described it as something new under the name *Phalaris zizanioides*. Koenig, however, also sent specimens of the grass to Retzius, who published it as *Andropogon muricatus*†† in 1783. This name, which was suggested by Koenig himself, was

* Babu Rájendrala'la Mitra in Journ. As. Soc. Beng. (Hist. & Lit.), vol. xlii. (1873), p. 320; Proc. As. Soc. Beng. (1873), p. 161.

† *See* Dymock, Warden, and Hooper, Pharmacogr. Indica (1893), vol. iii., p. 572.

‡ Rheede, Hort. Malab., vol. xii. (1703), tab. 72.

§ Hermann, Mus. Zeyl. (1726), p. 51.

‖ Petiver. Mus. Petiv. (1699), p. 53, no. 559.

¶ Scheuchzer, Agrostogr. (1719), p. 103.

** Linnaeus, Mant. Alt. (1771), p. 183.

†† Retz. Observ., vol. iii. (1783), p. 43.

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subsequently adopted by Roxburgh and most other botanists. More recently,* however, it has been replaced by *Andropogon squarrosus*, a name adopted by the younger Linnaeus† for a plant, also communicated by Koenig, who found it "circa Zeylonam natans supra stagna profundiora," and entirely distinct from *Andropogon muricatus*. The specimen is still in Linnaeus' herbarium and was correctly identified by R. Brown‡ with his *Panicum abortivum*, that is *Chamaeraphis spinescens*, a characteristic floating grass of the Indo-Malayan region. Retzius§ himself is responsible for the erroneous reduction of *Andropogon squarrosus* to *Andropogon muricatus*, which recently has been revived, although Roxburgh‖ long ago drew attention to the confusion. '*Zizanioides*' being the earliest specific epithet, it will have to be adopted for the 'Khas Khas,' so that its name under *Vetiveria* must be *V. zizanioides*.

USES OF THE ROOTS.—Koenig, in a note reproduced by Retzius, remarks: "Tamulis Woetiwaer. Radices ab indigenis usitatissimae ob gratum odorem quem aqua irroratae spargunt. Ex his *Flabella* praecipue parantur quae pennis Pavonum ornantur." This property of the roots of 'Khas Khas' of emitting a pleasant odour as often as they are wetted and as long as they are wet was also mentioned by Jones¶ in 1795. It has led from early times to their being woven into screens and mats (tatties), which are hung over doors or set in windows; in hot weather, when frequently sprinkled with water, they cool and perfume the air. The fans (Tamil, visri) mentioned by Koenig act in the same way. The root, in the powdered state, enters into the composition of an *Abir*,** or perfumed powder used by the Hindus at the *Holi* festival. Such an Abir, *Abir Izkhir*, is already mentioned in the 'Ain-i-Akbari,'†† the Annals of the Emperor Akbar, the appellation 'Izkhir' standing here for 'Izkhir-i-Ajami,' that is 'Khas Khas.' The 'Schoenanthus' powder which Herbert de Jager‡‡ found in use at Golconda in the second half of the 17th century was also most likely 'Khas Khas' powder. For what he says is this: "In Golkonda, this *Schoenanthus* is used in powder-form for washing the hands on account of the very *pleasant odour it imparts very quickly to the water; but the odour ceases as soon as the hands are dry.*"

While, however, the use of the roots of *Vetiveria zizanioides* for medicinal purposes and in perfumery has been universal in India for a very long period, I have failed to find, among the earlier writers, any definite and indisputable reference to the extraction of an oil from them. It is true that Hessler, in his translation of Suśruta, mentions (vol. i., p. 160) "*Andropogi muricati spiritus distillatus*"; but the word which he renders as "*Andropogi* (sic) *muricati*" is 'Mrinala,' which by others, as for instance

* Hackel, Andropog. (in DC. Monogr. Phaner., vol. vi., 1889), p. 542.
† Linné fil., Suppl. (1781), p. 433.
‡ R. Brown, Prodr. Fl. Nov. Holl. (1810), p. 193.
§ Retz., l.c., vol. v. (1789). p. 21.
‖ Roxburgh, Fl. Ind., ed. Carey & Wall., vol. i. (1820), p. 270.
¶ Jones in Asiat. Research. vol. iv. (1795), p. 306.
** Dict. Econ. Prod. India, vol. i. (1885), p. 7.
†† Hooper, in Calcutta Review, Oct. 1904.
‡‡ Herb. de Jager, in Valentini, Hist. Simpl. (1732), p. 392. *See also* p. of this paper.

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by Dutt,* is interpreted as meaning the leaf-stalk of the Lotus, so that for this reason alone the passage quoted cannot be adduced as proof of an early knowledge of the distillation of oil from 'Khas Khas' or 'Vetiver.' Indeed, the distillation of Vetiver oil in India seems to be of very limited† extent and there is hardly any export, the oil being mainly produced in European distilleries from the imported root; but even the import of the roots as a regular article of commerce appears to be of comparatively recent date.

NATURAL AREA AND CULTIVATION.—The natural area of *Andropogon muricatus* in India and Ceylon includes practically the whole country, in the north up to altitudes of 600 m. Although common in many parts of the country, particularly on the banks of rivers and in rich, marshy soil, it is also at present, as in Rheede's time, occasionally cultivated, as for instance in Rajputana and in Chutia Nagpur. Eastwards the area extends into Burma. Throughout the Malayan region, however, it occurs only in the cultivated state or as an escape from gardens. It has also been introduced into the Mascarenes, the West Indies, and Brazil; but it seems that in these countries oil is not distilled to any appreciable extent, except perhaps in Réunion, where the grass must have been in cultivation for at least 100 years, as the first sample of Vetiver-oil that was chemically examined‡ (in 1809) came from there.

12. Andropogon (Sect. *Amphilophis*) odoratus, *Lisb.*

Usadhana.

This is a little-known grass which was discovered by Dymock at Thana in 1875 and mentioned on account of its strong odour of ginger under its vernacular name, Usadhana, in the first edition of his "Materia Medica of Western India" (p. 693). In the second edition of that work (p. 853) it was referred to *Andropogon Nardus*. Subsequently it was, however, recognised as a new species by Mrs. J. C. Lisboa,§ and described as *A. odoratus*. This very aromatic grass is used by the peasantry of the Thana district for medicinal purposes. An essential oil of a golden-yellow to a deep sherry colour, with a distinctive odour, was obtained from it by distillation, but it has not yet become an article of commerce. The odour is, according to the "Pharmacographia Indica," vol. iii., p. 570, at first that of cassia and rosemary, but afterwards that of oil of cassia or, according to Gildemeister and Hoffmann,‖ that of pine-needle oil.

GINGER-GRASS.

(Gildemeister and Hoffmann, Volatile Oils, p. 285.)

Gildemeister and Hoffmann mention in their work on volatile oils a "ginger-grass oil," of which they say that it is "an inferior quality of palmarosa oil, or a mixture of the latter with much (up

* Dutt, Mat. Med. Hind., ed. 2. (1900), p. 109.

† Duthie (Fodd. Grass. N. India, p. 37) mentions that at Bhira, in Oudh, a perfume called *itae* is extracted from the roots of *Vetiveria zizanioides*, and used medicinally under the name of *urayia*.

‡ Vauquelin, in Ann. Mus. Hist. Nat. Par., vol. xiv. (1809), pp. 28-31.

§ Lisboa in Journ. Bomb. Nat. Hist. Soc., vol. iv. (1889), p. 123.

‖ Gildemeister & Hoffmann, Vol. Oils, p. 299.

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to 90 per cent.) turpentine oil or mineral oils," and further, that "occasionally other grasses are also used in the distillation (*Andropogon laniger* ?), for some ginger-grass oils possess a phelandrene-like odour, which is entirely wanting in the palmarosa oil." In the Semi-Annual Reports of Schimmel & Co. for October–November, 1902, Ginger-grass oil of good quality is, however, spoken of as available from a new source of production on the Madras coast. In the April–May number of the same Reports for 1904, it is stated that phellandrene was detected in the portions boiling up to 80°, geraniol was also obtained, and a new alcohol ($C_{10}H_{16}O$). Investigations into the composition of this oil were continued, and in the October–November number of the Semi-Annual Reports for 1904, Schimmel & Co. further indicate (p. 46) the presence of two turpenes (*d*-limonene and dipentene). The aldehyd has a peculiar odour, which suggests both œnanthic aldehyde and citronellal. In the complete absence of herbarium specimens it is, of course, impossible to trace the origin of this oil. It may, however, be useful to mention that the name 'ginger-oil' or its equivalents in various Indian languages has been in use for a considerable time. 'Ginger-grass' is, for instance, mentioned by Ainslie in his 'Materia Medica' (1813), p. 115, together with its Tamil equivalent, 'Shukkunari-pillu.'* In this case the grass was *Cymbopogon flexuosus* (*see* p. 319). Since then the name has been more frequently used for *Cymbopogon Martini*. Among the vernacular names, those derived from the Sanscrit name Soñt (dry ginger), and therefore equivalent to the English name 'Ginger-grass,' have been variously applied. Stolz has, for instance, *Çunthi-hulla* for *C. Martini*. Edgeworth, according to Duthie, has '*Sent* (*sentha*)' for *Vetiveria zizanioides*, whilst '*Sondhi*' stands as one of the Indian synonyms of *Izkhir* in the Makhzan el Adwiyah.

II.—CONSPECTUS OF THE OIL-GRASSES OF INDIA.

Key to the Grasses.

CYMBOPOGON.—Racemes of spikelets paired on a common peduncle which is supported by and often enclosed in a more or less boat-shaped bract (spathe); all the sessile spikelets alike, with the exception of one (or more) at the base of the racemes (at least of one of each pair).

Tardily flowering perennials; innovations intravaginal, forming dense tufts; culms from dense bunches of firm, persistent leaf-sheaths, more or less widened below; blades long, hard, rough-edged throughout, filiform to linear; the first (outer) glume of the sessile spikelet flat or concave between the keels:—

Panicle narrow, of short, dense fascicles of raceme-pairs; raceme-joints villose all over, hairs long, more or less concealing the sessile spikelets; awn usually a straight, very short bristle (Series *Schoenanthi*):—

Basal leaf-sheaths in dense tufts, tightly clasping, thickened below; blades more or less filiform and flexuous, except when very short; raceme-fascicles more or less simple 1. *C. Schoenanthus.*

* Shukku, Tamil for the dried root of ginger.

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Basal leaf-sheaths ultimately loosened and curled; blades flat; raceme-fascicles compound . . 2. *C. Jwarancusa.*

Panicles more often large and very compound; raceme-joints glabrous or pubescent on the back, bearded along the sides, hairs increasing in length upwards, but not concealing the sessile spikelets; awns, if present (they are normally absent in the cultivated forms), distinctly geniculate with the knee exserted (Series *Citrati*) :—

Sessile spikelets lanceolate or ovate- or obovate-lanceolate; back flat :—

Lowest pedicel of raceme scarcely stouter than the upper :—

All the spikelets awnless 3. *C. Nardus.*

Sessile spikelets awned :—

Panicle erect, dense, often interrupted, with rather conspicuous, frequently purplish-brown to blackish spathes 4. *C. confertiflorus.*

Panicle loose, with slender, long, flexuous, often drooping branches and comparatively inconspicuous spathes, the whole panicle often greyish 5. *C. flexuosus.*

Lowest pedicel of racemes much swollen; panicles erect, narrow, often interrupted, the divisions short, dense; spathes and racemes short, the white hairs of the joints and panicles often very conspicuously contrasting with the pale brown spikelets 6. *C. coloratus.*

Sessile spikelets linear to lanceolate-linear, awnless; back distinctly concave in the lower part; panicle usually loose; branches slender, the ultimate branchlets more or less nodding; spathes long and narrow; hairs of joints and pedicels rather spreading 7. *C. citratus.*

Perennials, sometimes flowering the first year (or sometimes annuals?); innovations mixed (extravaginal and intravaginal), forming fascicles from a short collar or very short, slender, oblique rhizome; old culms naked at the base or with the withered remains of the basal leaf-sheaths; blades flat, 5–30 mm. wide, rounded to subcordate and stem-clasping at the base, of a soft texture, with smooth edges (at least in the lower part); the first (outer) glume of the sessile spikelet with a narrow groove from the middle downwards corresponding to a keel inside (Series *Rusae*) :—

Culms in loose, rather scanty fascicles, erect and simple or nearly so, usually tall and robust; basal sheaths soon withering; blades 10–30 mm. wide (rarely under 10 mm.), somewhat fat, rich green, at least above; panicles 10–30 cm. long, rather loose, turning reddish (often very bright) when mature 8. *C. Martini.*

Culms in somewhat loose, often copious fascicles, erect or geniculately ascending, very slender, frequently branched, the branches often in fascicles from the knees of the culms; sheaths soon withering; blades 2–6 mm. wide, thin, glaucous; panicles usually loose, 10–20 cm. long, glaucous or straw-colour when mature 9. *C. caesius.*

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Culms in compact fascicles, erect, simple, wiry; basal sheaths more persistent than in the two preceding species; blades 6–10 mm. wide, somewhat firm, rich green above, glaucescent below, often suffused with purple near the base and along the edges; panicle stiff, dense, 6–10 cm. long; spathes more herbaceous than in the other species, often with rudimentary blades, purplish-brown with yellowish scarious edges; spikelets usually green in the lower, purple in the upper part . . 10. *C. polyneuros.*

VETIVERIA.—Racemes panicled, peduncled, very slender, many-jointed, in copious whorls on the nodes of an often long rhachis; joints and pedicels filiform, glabrous or nearly so; spikelets laterally or dorsally slightly compressed; the sessile all alike, awned or awnless; first (outer) glume muricate or smooth.

Innovations forming dense, compressed bunches of leaves with equitant sheaths and keeled, fat (almost spongy) blades which are more or less V-shaped in cross section; spikelets muticous, muricate 11. *V. zizanioides.*

ANDROPOGON Sect. AMPHILOPHIS.—Racemes fascicled or panicled, peduncled, slender, few- to many-jointed; joints and pedicels linear, flat, usually translucent between the thickened edges; all the sessile spikelets alike, dorsally compressed, awned.

Innovations forming dense bunches of leaves with compressed, smooth sheaths and flat, bright green, somewhat strongly-nerved leaves, 4–8 mm. wide; racemes densely fascicled, often very numerous, 2·5–5 cm. long, flexuous, purplish, silky; sessile spikelets villous below the middle with a silky callus 12. *A. odoratus.*

1. **Cymbopogon Schoenanthus,** Spreng. Pug. vol. ii. (1815), p. 15, non Schult.—Transferred from *Andropogon* (*A. Schoenanthus*, L.).

DESCRIPTIONS.—Hackel, Androp. p. 598 (under *Andropogon laniger*), and Hook. f., Fl. Brit. Ind., vol. vii., p. 203 (under *A. Iwarancusa*, subsp. *laniger*); for the anatomy of the leaves, Duval-Jouve in Ann. Sc. Nat., sér. vi., vol. i., p. 355, tab. 18, fig. 2 (under *A. lanigerum*), and Hoehnel in Sitzber. Akad. Wiss. Wien, vol. lxxxix., part i. (1884), pp. 6–15, with tab. (under *A. Schoenanthus*).

ILLUSTRATION.—Hooker's Icon. Plant., tab. 1871 (under *A. laniger*, from a specimen from Jedda, Arabia, distributed as *Cymbopogon circinnatus*);—not very characteristic.

SYNONYMS.

Cymbopogon arabicus, Nees ex Steud. Syn. Pl. Glum. vol. i. (1855), p. 387.—Quoted as a synonym under *Andropogon circinnatus.*

C. Arriani, Aitch. Cat. Punj. Pl. (1869), p. 174.—Transferred from *Andropogon* (*A. Ariani*, Edgew.).

C. circinnatus, Hochst. in Schimp. Pl. Arab., ed. 2 (1844), no. 789 (name only).—Quoted as a synonym by Hackel under *A. laniger.*

Andropogon Schoenanthus, L. Spec. Plant., ed. 1 (1753), p. 1046.—Based on '*Schoenanthi Herba*' officinarum.

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A. bicornis, Forsk. Fl. Aegypt. Arab. (1763), p. 173, non L. —From specimens collected by the author in the Hedjas.

A. laniger, Desf. Fl. Atl. vol. ii. (1800), p. 379.—From specimens collected by the author at Gafsa, Tunis.

A. Olivieri, Boiss. Diagn. Pl. Or. ser. i. fasc. v. (1844), p. 76. —From specimens collected by Aucher in Mesopotamia, no. 2955.

A. circinnatus, Hochst. et Steud. Herb. Un. It., no. 789 (name only); Steud. Syn. Pl. Glum. vol. i. (1855), p. 387.—From specimens collected by Schimper near Jedda.

A. Arriani, Edgew. in Journ. Linn. Soc. vol. vi. (1862), p. 208. —From specimens collected by the author in the Panjab.

A. Iwarancusa, subsp. *laniger*, Hook. f. Fl. Brit. Ind. vol. vii., p. 203.

Gymnanthelia lanigera, Anderss. in Schweinf. Beitr. Fl. Aethiop. (1867), p. 310 (name only).—Quoted as a synonym by Hackel under *A. laniger*.

DISTRIBUTION.—From Morocco to the Panjab and Ladak. The area is broken up into a number of sometimes very distant sub-areas: (*a*) North Africa from south-west Morocco along the southern edge of the Atlas to Tunis; (*b*) Arabia, south of 18° N.; (*c*) western and south-western outskirts of the Persian highlands from 36° N. to Daleki (29° N.) on the Persian Gulf; (*d*) Kerman, up to 2000 m. or higher; (*e*) from south-west Afghanistan and north-west Baluchistan to the Panjab and the Sikh States, and in the Indus valley up to 2000 m. or higher. The eastern limit is ill-defined, as here the areas of *C. Schoenanthus* and *C. Iwarancusa* overlap, and numerous transition forms occur. In the Panjab it is common in some of the desert tracts from Karachi to Peshawur and Ludhiana, growing on rocks, in sand or in hard, loamy soil.

HERBARIUM SPECIMENS EXAMINED.—SIND: Without precise locality, *Stocks*, 816, 690. WAZIRISTAN: *Duthie's collector*, 15,721, 15,738; Dera Ismail Khan, *Herb. Duthie*, 7224. PANJAB: Kuram Valley, Shalian plains, 1500 m., *Aitchison*, 6; Para Chenar, *Duthie's collector*, 14,800; Salt Range, Bhirpur, *Aitchison*, 59; Loodiana, *Edgeworth*; Sikh States, Balawali, *Edgeworth*. CHITRAL: Dir, *Herb. Duthie*, 6762; Warai, 1350 m., *Herb. Duthie*, 17,609; Moikandi, 1740 m., *Herb. Duthie*, 16,763. KASHMIR: Province of Kashmir, Ramu, 1800 m., *C. B. Clarke*, 28,501; Gilgit, Astor Valley, 1800 m., *Duthie*, 12,301; Doyan, 2130 m., *Giles*; Gilgit River, 1380 m., *Giles*; Chalt, *Winterbottom*; Niltar Valley, near Nomal, 1500–1800 m., *Duthie*, 12,335; Baltistan, near Scardu, *Thomson*; *Duthie*, 12,045.

OIL.—(Camel-grass oil).—Production very limited and local in the Panjab, mostly for medical purposes. Yield about 1 per cent. of the dry grass as sold in bazaars (Dymock). Composition unknown. Specific gravity 0·905 at 29·5° (Dymock), 0·915 at 15° (Schimmel & Co.); angle of rotation, $\alpha_D - 4°$ (Dymock), + 34° 38′ (Schimmel & Co.). Distills between 170–250°.

VERNACULAR NAMES.—*Arabic:* Izkhir (the grass as sold in the bazaars); Máhareb (Cairo, Schweinfurth); M'hâh (Hedjas, Forskal). *Persian:* Gor-giyah (Wild Ass grass; Ulfaz Udwiyah, 1450). *Hindustani:* Khavi (Edgeworth, 1840); Ghatyari (Baden Powell).

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2. **Cymbopogon Jwarancusa**, Schult. Mant. ii. (1824), p. 458. Transferred from *Andropogon* (*A. Jwarancusa*, Jones).—Based on Blane's paper on the 'Nardus Indica or Spikenard' in Phil. Trans., vol. lxxx. (1790), p. 284, and on the accompanying figure (tab. 16): the first technical description was by Roxburgh, Fl. Ind. (ed. Carey & Wall.), vol. i. (1820), p. 279, who spelt "*Iwarancusa*" instead of "*Jwarancusa*." Original in Herb. Smith, at the Linnean Society, London.

DESCRIPTIONS.—Trinius, Spec. Gram. Ic., text accompanying tab. 326; Hackel, Androp., p. 599 (var. *genuinus*); Hook. f., Fl. Brit. Ind., vol. vii. p. 203 (*A. Iwarancusa* "proper").

ILLUSTRATIONS.—Blane l.c.; Trinius, l.c.; Duthie, Fodd. Grass. N. India, tab. 23 (under *A. laniger*, a form approaching *A. Schoenanthus*).

SYNONYMS.

Andropogon Jwarancusa, Jones, in Asiat. Research. vol. iv. (1795), p. 109 (name and reference to Blane).

A. laniger, Duthie, Fodd. Grass. N. India, t. 23.

DISTRIBUTION.—Outer hillzone of the United Provinces, Kumaon, Garhwal (up to 3000 m. or over) and westwards as far as Peshawur; mainly in the neighbourhood of watercourses.

HERBARIUM SPECIMENS EXAMINED.—PANJAB: Rawul Pindi, *Aitchison*, 97, 562; Jhelum, *Stewart*, 157; Lahore, *Thomson*; Firuzpur, *Griffith*, distr. no. 6770; Spiti, *Lance*, 295. KASHMIR: Baltistan, between Khalse and Nurla, among rocks close to the river, *Thomson*; near Leh, 3000 m., *Thomson*. UNITED PROVINCES: without precise locality, *Royle*; bed of Jumna, *Falconer*; Hurdwar, *Boyd*; between Agra and Saharanpur, "radice odoratissima," *Jacquemont*, 352. Garhwal; Tonse valley very common, *Jacquemont* 398; 900–1200 m., *Duthie*, 15,579, 14,499; without precise locality, *Stewart*, 404. Kumaon; Almora, 1500 m., *Strachey & Winterbottom*, 5; *Thomson*. Oudh; North Oudh, *Thompson*; Rapti Valley, *Blane*. NEPAL: without precise locality, *Wallich*. BENGAL: Dinajepur Distr., Kantanagar, *Hamilton*.

OIL.—Unknown. The grass is very probably used along with *C. Schoenanthus*.

VERNACULAR NAMES.—*Sanskrit*: Jwarânkusa (*i.e.*, fever-restrainer). *Bengali*: Karankusa (Roxburgh, 1814; Dutt). *Hindustani*: Khavi (*see* A. Schoenanthus). For further vernaculars *see* Duthie, Fodd. Grass. N. Ind., p. 36.

3. **Cymbopogon Nardus**, Rendle, in Cat. Welw. Afr. Pl. vol. ii. (1899), p. 155.—Transferred from *Andropogon* (*A. Nardus*, L.).

DESCRIPTIONS.—Hackel, Androp. pp. 601–602 (subsp. *genuinus*), and Hook. f. in Trimen, Fl. Ceyl., vol. v., p. 242.

ILLUSTRATIONS.—None.

SYNONYMS.

Andropogon Nardus, L. Spec. Plant. ed. 1 (1753), p. 1046. Based on Hermann's specimen of 'Pengriman.'—Original at the British Museum.

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DISTRIBUTION.—Only known in cultivation: Ceylon, particularly in the South; Malayan Peninsula; Java.

HERBARIUM SPECIMENS EXAMINED. — CEYLON: without precise locality, *Macrae; Walker; Thwaites*, 2733: Watwalla, near Galle, cultivated, *Thwaites*, Nov. 1858 (Herb. Pharm. Soc.); Galle, cultivated as "Old Citronella grass" (Winter's grass), and other specimens as "New Citronella grass (Lanu Batu)," comm. *Breitenstein*; Bundarawalla, *Jowitt*, 2383–2386, 2388, 2389. PENANG: Batu Feringi, cultivated (?), *Curtis*, 91. JAVA: Buitenzorg, cultivated, *Treub*. JAMAICA: Hope Gardens, cultivated, *Harris*.

OIL.—(Oleum Citronellae; Citronella oil). — Production in Ceylon (1905), 1,282,471 lbs. (Tropic. Agricult., Aug. 1905) from 40,000–50,000 acres; in the Malay Peninsula (1903) about or under 30,000 lbs. from about 2000 acres (Gildemeister and Hoffmann). Yield in per cent. of the dry or fresh grass unknown; per acre about 352–440 oz. in the summer, 110–220 oz. in the winter. Composition: (*a*) *Maha Pangiri*, Citronellal 50·45–55·34 per cent., Geraniol 38·15–31·87 per cent., Methyl Eugenol 0·78–0·84 per cent.; (*b*) *Lenubatu Pangiri*, Citronellal 28·2 per cent., Geraniol 32·9 per cent., Methyl Eugenol 8·0 per cent. Specific gravity: (*a*) *Maha Pangiri* 0·886–0·900; (*b*) *Lenubatu Pangiri* 0·900–0·920. Angle of rotation: (*a*) Maha Pangiri, $\alpha_D = -0·34$ to $-3°$; (*b*) *Lenubatu Pangiri*, $\alpha_D = -5°$ to $-21°$.

VERNACULAR NAMES.—*Singhalese*: Panagiri mana; Maha Panagiri mana (the original variety, also known as Winter's or Old Citronella grass); Lenubatu Panagiri mana (the new variety, New Citronella grass). *English*: Citronella grass.

4. **Cymbopogon confertiflorus**, Stapf.—Transferred from *Andropogon* (*A. confertiflorus*, Steud.).

DESCRIPTIONS.—Steud. Syn. Pl. Glum. vol. i. (1855) p. 384; Hook. f., Fl. Br. Ind., vol. vii., p. 206 (under *A. Nardus*, var. *nilagiricus*).

ILLUSTRATION.—None.

SYNONYMS.

Andropogon confertiflorus, Steud. Syn. Pl. Glum., vol. i. (1855), p. 384.—Based on Hohenacker, Pl. Ind. Or. (M. Nilagiri), no. 932, distributed as *A. nilagiricus*, Hochst.

A. nilagiricus, Hochst. in Hohenacker, Pl. Ind. Or. (M. Nilagiri) (1851), no. 932.—Name only, on the distribution label; quoted as a synonym by Hackel, Androp. (1889), p. 604.

A. nardoides, α *major*, Hochst. ex Steud., l.c.—Quoted as a synonym by Steudel, l.c.

A. Nardus, var. *nilagiricus*, Hack. Androp. (1889), p. 604.—Based on Hohenacker, no. 932.

DISTRIBUTION.—Nilgiris, Anamallai and Palni Hills; Ceylon, chiefly in the 'patanas' up to 1500 m.

HERBARIUM SPECIMENS EXAMINED.—MADRAS PRESIDENCY: Nilgiri Hills, *Schmidt*; *Hohenacker*, 932; *Thomson*; Madras

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Coll. 20, 36, *Gamble*; Coimbatore District, Anamallai Hills, *Beddome* (Brit. Mus.); Madura District, Palni Hills, Naduwattam; *Barber*, 2642, 2643. CEYLON: Bundarawatta, *Jowitt*, 2382, 2387, 2390, 2391; without precise locality, *Gardner*, 1037; *Maxwell*.

OIL.—Not produced commercially; 'good' according to Willis, but the yield is small. Properties unknown.

VERNACULAR NAMES.—*Singalese:* Mana. *Toda* (Nilgiris): Bämbe (Hohenacker).

5. **Cymbopogon flexuosus**, Stapf.—Transferred from Andropogon (*A. flexuosus*, Nees ex Steud.).

DESCRIPTIONS.—Steud. Syn. Pl. Glum. vol. i. (1855), p. 388; Hack. Androp., p. 603 (under *A. Nardus*, var. *flexuosus*); Hook. f. Fl. Brit. Ind., vol. vii. p. 207 (under *A. Nardus*, var. *flexuosus*).

ILLUSTRATIONS.—Rheede, Hort. Malab. vol. xii. tab. 57 (Kodi-pullu); Bentley and Trimen, Med. Pl. tab. 297 (under *A. Nardus*).

SYNONYMS.

Andropogon flexuosus, Nees in Wight, Cat. (1833), p. 100 (name only); Steud. Syn. Pl. Glum., vol. i. (1855), p. 388.—Based on Wight, No. 1704 (171*a* of Wight's own herbarium).

A. Nardus, var. *flexuosus*, Hack., Androp. (1889), p. 603.

DISTRIBUTION.—Tinnivelli District and Travancore.

HERBARIUM SPECIMENS EXAMINED.—TRAVANCORE: "abundant on the plains," *Waring* (Herb. Hanbury): Cochin, *Barber*, 2934. MADRAS PRESIDENCY: Madura District, Palni Hills, at 1200 m., *Beddome* (Brit. Mus.); Naduwattam, *Barber*, 2695; Tinnivelli Distr., Courtallum, *Klein*. (A specimen of Klein's is in Wight's herbarium, placed with Wight, 1704, distributed as "*Andropogon* (*Cymb.*) *flexuosus*, N.E." They are so much alike that it seems probable the distributed specimens were made up from Klein's collection). A specimen of this flowered at Kew last year. Another cultivated specimen, grown in the A. H. Gardens at Madras is in the herbarium of the India Museum, Calcutta.

OIL.—(Malabar or Cochin Lemon-grass oil).—Export from the Malabar Coast (1896–97), 270,000 kilos = 595,080 lbs. (Gildemeister and Hoffmann). Yield in per cent. of the dry or fresh grass unknown. Composition: Mainly citral (70–75 per cent.); specific gravity: 0·899–0·903. Angle of rotation uncertain. Readily soluble in alcohol, even in dilute alcohol.

VERNACULAR NAMES.—*Malayalim* (?): Kodi-pullu (Rheede, 1703; can this be meant for the *Canarese* Kádi pillu = sour grass?) or Pullu (grass; Bourdillon); *Tamil:* Shukkunari pillu (Courtallam, Herb. Wight; literally ginger-grass; Ainslie, 1813).

6. **Cymbopogon coloratus**, Stapf.—Transferred from Andropogon (*A. coloratus*, *Nees*).

DESCRIPTIONS.—P. 321 of this paper; Hook. f., Fl. Brit. Ind., vol. vii., p. 206 (under *A. Nardus*, var. *coloratus*).

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ILLUSTRATION.—None.

SYNONYMS.

Andropogon coloratus, Nees, in Wight, Cat. (1833) no. 1703 (name only).

A. Nardus, var. *coloratus*, Hook. f., Fl. Brit. Ind., vol. vii., p. 206.

DISTRIBUTION.—From the Tinnivelli District to the Anamallai Hills and throughout the Carnatic.

HERBARIUM SPECIMENS EXAMINED.—MADRAS PRESIDENCY: Tinnivelli Distr., Courtallum, *Thomson* (Herb. Hanbury); Mandunthorai Ghaut, *Barber* Coll., 2765, 2769; Koilpatti, *Barber* Coll., 3437; Madura District, Palni Hills, 300–600 m., *Barton Wright* in Barber's Coll.; *Beddome* (Brit. Mus.); Coimbatore District, Anamallai, Poonachi Ghaut, *Barber* Coll., 3582, 3752; Trichinopoli Distr., Trichinopoli, *Griffith*; North Arcott District, *Beddome* (Brit. Mus.); Cuddapa District, *Beddome* (Brit. Mus.); without precise locality: "Sent from Fort St. George" (Madras), *Bulkley* (Herb. Du Bois); *Klein*, 9 July, 1808 (a specimen of Klein's is in Wight's Herbarium, placed with Wight, 1703, distributed as "*Andropogon* (*Cymb.*) *coloratus*, N.E.," and it is possible that the specimens distributed by Wight as 1703 were taken from Klein's material); *Wight*, 3087, 3094; Wight, 1700*c* and 1700*d* (the latter diseased); *Heyne* in Herb. Wallich, 8794, B, D.

OIL.—Unknown. The grass is possibly one of the 'lemon-grasses' of the Malabar District.

VERNACULAR NAMES.—*Tamil*: Manjen pillu (Bulkley, 1703); Manakru pillu (Klein, 1794); Senga manu mala pillu (Griffith); Sengana pillu (Herb. Barber).

7. **Cymbopogon citratus**, Stapf.—Transferred from *Andropogon* (A. citratus, DC.; Nees).

DESCRIPTIONS.—Rumphius, Herb. Amboin., vol. v., p. 181 (under *Schoenanthum amboinicum*); Nees in Allgem. Gartenzeit. vol. iii. (1835), p. 266; also my remarks on pp. 332, 333.

ILLUSTRATIONS.—Rumphius, l.c., tab. 72; and the plate accompanying this paper, presented by the Bentham Trustees.

SYNONYMS.

Andropogon Schoenanthus, L., Syst. ed. x. (1759), p. 1304, not of Spec. Plant.; Roxburgh, Fl. Ind., ed. Carey & Wall. (1820), vol. i., p. 278.—Original from Roxburgh's garden at the British Museum.

A. citratus, DC. Cat. Hort. Monsp. (1813), p. 78 (only very imperfectly described); Nees, in Allgem. Gartenzeit., vol. iii. (1835), p. 266 (full description).—Based on specimens cultivated in various European gardens as *A. citratus* or *A. citriodorus*, or 'Lemon-grass,' in the earlier part of the last century. A specimen of this 'Lemon-grass' from Lambert's garden (not later than 1810) is at the British Museum.

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A. citriodorum (sic), Desf. in Tabl. École Bot., ed. 2 (1815), p. 15.—Quoted as a synonym under *A. Nardus*.

A. Roxburghii, Nees, in Wight, Catal. (1833), no. 1699 (name only); Steud. Syn. Pl. Glum., vol. i. (1855), p. 395.

A. ceriferus, Hack. in Mart. Fl. Bras., vol. ii., part iii. (1883), p. 281.—From specimens cultivated near Rio Janeiro, and distributed by Glaziou, 4296.

A. Nardus, var. *ceriferus*, Hack. Androp. (1889) 605.—*A. ceriferus* reduced to a variety of *A. Nardus*.

Schoenanthum amboinicum, Rumph. Herb. Amboin. vol. v. p. 181, t. 72.

DISTRIBUTION.—Only known in the cultivated state. Most tropical countries.

HERBARIUM SPECIMENS EXAMINED.—MADRAS PRESIDENCY: South Coromandel, *Rottler*; Circars, Samulcotta, *Hort. Dr. Roxburgh* (Brit. Mus.). CEYLON: *Thwaites* (Herb. Hanbury). TENASSERIM: Without precise locality, *Helfer*, 934; Mergui, *Griffith*, 303 of Herb. Wight, Distrib. no. 6762 (Wight's specimens distributed as 1699 are evidently from Griffith's collection). JAVA: *De Vry* (Herb. Hanbury); Buitenzorg, comm. *Treub*. BORNEO: Labuan, *Burbidge*. HONG KONG: *Hance*, 255 (Brit. Mus.). FIJI: Uvea, *Gräffe* (?) (Herb. Hanbury). MAURITIUS: *Bojer*; *Bouton* (Herb. Hanbury). MADAGASCAR: Central Madagascar, *Baron*, 2737. PORTUGUESE WEST AFRICA: Mossamedes, *Welwitsch* (Brit. Mus.); Loanda, *Welwitsch* (Brit. Mus.). WEST INDIES: S. Vincent, *Guilding* (Brit. Mus.); Jamaica, *Bertero* (Herb. Turin), *N. Wilson* (Herb. Hanbury); Portorico, Maricao, *Sintenis*, 222.

OIL.—(Oleum Sereh, O. Andropogonis citrati, Lemon-grass oil, Essence de Verveine des Indes).—Export from Ceylon (1883), about 1500 lbs.; from the Straits Settlements, 2000–3000 lbs. (Gildemeister & Hoffmann). Yield from the fresh grass (Brazilian), 0·24–0·4 per cent., according to season. Composition, similar to that of Malabar-grass oil (*C. flexuosus*). Citral content, 77 per cent. Specific gravity, 0·895; angle of rotation, $\alpha_D = 0° 8'$. Solubility in alcohol very much less than that of Malabar-grass oil.

VERNACULAR NAMES.—*Tamil:* Vāsana-pillu (S. Browne, 1696; literally 'perfume grass'); Karpūra pillu (Watt, 1869; literally 'camphor-grass'). *Telugu:* Vāsana gaddi (Stolz, 1881); Chippa gaddi (Elliot, 1859); Nimma gaddi (Elliot, 1859). *Malayalim:* Vāsanap-pullu (Mooden Sheriff, 1869). *Canarese:* Vāsane-hullu (Mooden Sheriff, 1869); Kāvanče hullu (Stolz, 1881); Majjige hullu (Stolz, 1881). *Mahratı:* Oleu cha and Hirva cha (Watt, 1889; both literally 'green' or 'greenish tea'). *Dukni:* Naring ke bās ka ghans (Ainslie, 1813; literally 'orange-grass'). *Gujerati:* Lili cha (Watt, 1889; literally 'green tea'). *Burmese:* Sa-ba-lin (Mason, 1860). *Chinese:* Mao-hsiang (Loureiro, 1790; literally 'fragrant Mao'). *Malay:* Sereh (De Jager). *Tagalog* (Philippines): Tañglad (Nieremberg, 1635). *Portuguese:* Herba cheirosa (Rottler), Capim de Cheiro (Peckolt). *Spanish:* Grama de limon and Limoncillo (Grosourdy, 1864). *French:* Citronelle; Verveine des Indes. *English:* Lemon-grass.

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8. **Cymbopogon Martini**, Stapf.—Transferred from *Andropogon* (*A. Martini*, Roxb.).

DESCRIPTIONS.—Roxburgh, Fl. Ind. ed. Carey & Wall., vol. i. (1820), p. 280; Trinius, in Mém. Ac. Pétersb. sér. 6, vol. ii., p. 284, and Spec. Gram. Ic., the text accompanying tab. 327 (under *A. pachnodes*); Hook. f., Fl. Brit. Ind., vol. vii., p. 204 (under *A. Schoenanthus*, var. *Martini*).

ILLUSTRATIONS.—Trinius, Spec. Gram. Ic., tab. 327 (under *A. pachnodes*); Royle, Illustr. Bot. Himal. tab. 280 (under *A. Calamus aromaticus*); Duthie, Fodd. Grass. N. Ind., tab. 26 (under *A. Schoenanthus*, L.).

SYNONYMS.

Cymbopogon Martinianus, Schult. Mant. ii. (1824), p. 459.—Transferred from *Andropogon* (*A. Martini*, Roxb.).

Andropogon Martini, Roxb. Fl. Ind. ed. Carey & Wall., vol. i. (1820), p. 280.—Based on specimens "raised from seeds collected by General Martin in the Balaghat."—Original at the British Museum.

A. pachnodes, Trin. in Mém. Ac. Petersb. sér. 6, vol. ii. (1833), p. 284, and Spec. Gram. Ic. (1836), tab. 327.

A. Calamus aromaticus, Royle, Essay Antiq. Hind. Med. (1837), p. 33 (name only); Illustr. Bot. Himal. (1840), tab. 280.—Intended for the Rusá grass.

A. nardoides, *a*, Nees, Fl. Afr. Austr. (1841), p. 116.

A. Schoenanthus Flück. and Hanb., Pharmacogr. (1874), p. 660, non L.—Intended for the Rusá grass.

A. Schoenanthus, var. *genuinus*, Hack. Androp. (1889), p. 609 (partly).—*See* p. 304.

A. Schoenanthus, var. *Martini*, Hook. f., Fl. Brit. Ind., vol. vii. (1897), p. 204, excluding certain synonyms which refer to African plants.—Intended to cover *A. Martini*, Roxb.

DISTRIBUTION.—From the Rajmahal Hills in Bengal to the Afghan frontier and from the sub-tropical zone of the Himalaya to about 12° N., excluding the desert region of the Panjab and the greater part of the northern Carnatic. The south-eastern and southern limit does not seem to be well defined, as the area there overlaps that of the closely allied *C. caesius*.

HERBARIUM SPECIMENS EXAMINED.—PANJAB: Hazara, Black Mountains, Susal Pass, *Duthie*, 7585 (*a*)*; between Dhamtaur and Mansera, 600 m., *Falconer's* coll. (*l*). Fatehabad (Peshawur District ?), *Falconer's* coll. (*i*), Beas—Chenab Doab, *Thomson* (*a*). Chamba, Manjir, *Lace*, 1291 (*l*), (Herb. India Mus.). Kangra, between Nurpur and Kotla, 600 m., *Watt*, 15,216 (*i*). Hissar, *Coldstream* (*l*), (Herb. India Mus.). Simla Hills, *Falconer's* coll. (*i*); 300–600 m., *Jacquemont*, 1516 (*a*). Bashahr, Rampur, *Thomson* (*i*). KASHMIR: Jhelum Valley, 600 m., *C. B. Clarke* coll., 13,721 (*a*). UNITED PROVINCES: Saharanpur, *Thomson* (*i*); Moradabad, *Thomson* (*i*). Garhwal, without precise locality, up to 105 m.,

* *a* designates narrow-leaved; *i* intermediate; and *l* broad-leaved forms.

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Stewart, 405 (*l*), 396 (*i*); Adh-badhri, 1350 m., *Strachey & Winterbottom* (*l*); Srinagar, *Thomson* (*l*); Kumaon; Almorah, *Madden* (*l*). NEPAL: *Wallich* (*l*). BENGAL: Monghyr, *Wallich*, 8795 (*l*); Rajmahal Hills, *Jacquemont*, 105, 166 (*a* and *l*). Chutia Nagpur, Singhbum, Nonda, *C. B. Clarke*, 34,251 (*l*). RAJPUTANA: Mhairwara, *Duthie*, 4921, 4921*a* (*i* and *l*); Ajmere, *Rep. Econ. Prod.*, 20,205 (*l*). GWALIOR: *Maries* (*l*), (Brit. Mus.). BOMBAY PRESIDENCY: Khandeish; Sholapur Hill, *Young* (*a*), (Brit. Mus.); Shendurni, *Young* (*a*), (Brit. Mus.); Malegaon, *Young* (*a*) (Brit. Mus.). Dharwar District, *Burkill* (*a* and *i*); *Young* (*a*); *Barber Coll.*, 6138 (*a*). CENTRAL PROVINCES: Nimar District, without precise locality, comm. *Duthie* (a number of specimens, varying from *a* to *l*); Asirgarh Fort, *Duthie*, 8464 (*i* to *l*); Nagpur; Warda, East Panch, *Rep. Econ. Prod.* 17,922, 17,923 (*l*); Chanda District, *Duthie*, 9901 (*l*). BERAR: Amraoti, *Fernandez* (several specimens, from *a* to *l*); Basim District, *Fernandez* (*a*); Buldana District, Pimpalgaon, *Young* (*a*), (Brit. Mus.). HAIDERABAD: Camp Rasanum, Kadangal Taluka, *Rep. Econ. Prod.* (*a*). MYSORE: Bangalore, drawing comm. by *Maj. Gen. Puckle* (*i*). MADRAS PRESIDENCY: Ganjam Distr., Gamsur, *Beddome* (*l*), (Brit. Mus.); Karnul District, *Barber Coll.*, 248 (*a*); Bellari, Bellari Farm, *Barber Coll.*, 6577 (*a*); Cuddapa District, *Beddome* (*a*), (Brit. Mus.); North Arcot, Arni, *Barber Coll.* (*a*); South Arcot, *Barber Coll.* 6060 (*a*); North Salem District, Pennagaram Reserve, 270 m., *Barber Coll.*, 6041 (*a*). BURMA: Southern Yoma, *Kurz* (*i*).

Without indication of locality: *Wight*, 1702; *Heyne* in Herb. *Wallich*, 8794 C.; Calcutta Bot. Gard.: *Roxburgh* (Brit. Mus.); *Hardwicke* (Brit. Mus.); *Wallich*, 8794 N.

OIL.—(Oleum Palmarosae seu Geranii Indici; Palmarosa oil; Rusá oil; East Indian Geranium oil).—Total production estimated at 20,000 kilos. per annum, = 44,080 lbs. (Gildemeister & Hoffmann, 1903). Principal district of production: Khandeish; yield about 0·3–0·4 per cent. from the fresh grass. Composition: mainly geraniol (76–93 per cent.). Specific gravity unknown. Angle of rotation varying from $\alpha_D = +1° 41'$ to $-1° 55'$. Soluble in three or more parts of alcohol.

VERNACULAR NAMES.—*Sanskrit:* Rohisha (Sušruta), Rosém (Sanskrit Dict.). *Hindustani*: Rusa (Makhzan-el-Adwiyah, 1771), Gandh-bel (Ulfaz Udwiyah, 1450) Mirchia gandh (Talif Sherif), Tikhari (Nagpur and Khandeish, Duthie, 1888). Suñthi, soñt (Makhzan-el-Adwiyah, 1772; literally, 'dry ginger'). *Marathi*: Rohish and Roshegavat (Duthie, 1888). *Gujerati:* Rhonse (Swinton, 1830), or Rauns (Duthie, 1888). *Canarese:* Çunthi hullu (Stolz, 1882; literally, 'ginger grass'); Kāci hullu (Stolz, 1881); Kasi hullu (Barber). *Tamil*: Kāvattam pillu (Stolz, 1881; Barber).

9. **Cymbopogon caesius**, *Stapf.*—Transferred from *Andropogon* (*A. caesius*, Nees).

DESCRIPTION.—Hook. f., Fl. Brit. Ind., vol. vii., p. 205.

ILLUSTRATION.—None.

* *a* designates narrow-leaved; *i* intermediate; and *l* broad-leaved forms.

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SYNONYMS.

Andropogon caesius, α and β, Nees in Wight Cat. (1833), Nos. 1700, 1700*b*, (name only).

A. Schoenanthus, var. *caesius*, Hack. Androp. (1889), p. 610.

DISTRIBUTION.—Throughout the Carnatic.

HERBARIUM SPECIMENS EXAMINED.—MADRAS PRESIDENCY: Tinnivelli; Courtallam, *Barber* Coll., 3315; Aulancolam, *Barber* Coll., 3346; Trichinopoli, *Griffith*, 104; Coimbatore District, Coimbatore, *Barber* Coll., 2558, 2588; Sangamir, *Barber* Coll., 4455; Chingalpat District, Saidapet, *Thomson*, Madr. Coll., 298. Sent from Fort St. George (Madras), *D. du Bois*, *Bulkley* (Herb. Du Bois).—Without indication of locality: *Wight*, 1700 (Herb. prop. 173*c*), 1700*a* (Herb. prop. 178), 1700*b*, 1806, 3348, 3090; *Wight* in Herb. *Wallich*, 8796; *Thomson*, Madr. Coll., 16, 29, 102.

OIL.—Not produced commercially. Yield 0·43 per cent. from fresh, 0·71 per cent. from dry grass. Composition unknown.

VERNACULAR NAMES.—*Tamil:* Kāmāṭči or Kāmākshi-pillu (S. Browne, 1696): Māndap pillu (Rottler, about 1800; literally 'Temple grass'). *Telugu:* Kamanchi gaddi (Elliot, 1859). *Canarese:* Kāmancha-hullu (Stolz, 1881).

10. **Cymbopogon polyneuros**, *Stapf.*—Transferred from *Andropogon* (*A. polyneuros*, Steud.).

DESCRIPTIONS.—Steudel, Syn. Pl. Glum. vol. i. (1855), p. 385; Hook. f., Fl. Brit. Ind., vol. vii., p. 205 (under *A. Schoenanthus*, var. *versicolor*).

ILLUSTRATION.—None.

SYNONYMS.

Andropogon versicolor, Nees in Wight, Cat. (1833), No. 1705 (name only), not of Steud.—Based on Wight, No. 1705.

A. polyneuros, Steud. Syn. Pl. Glum. vol. i. (1855), p. 385.—Based on Hohenacker, Pl. Ind. Or 1851, no. 933, distributed as "*A. nardoides β minor*, N. ab. E."

A. nardoides β minor, Nees ex Steud. (1855), l.c.—Quoted as a synonym; not of Nees, Fl. Afr. Austr.

A. Schoenanthus var. *versicolor*, Hack. Androp. (1889), p. 610 (partly).—In the first place no doubt intended for the Nilgiri plant.

DISTRIBUTION.—Nilgiris and Ceylon.

HERBARIUM SPECIMENS EXAMINED.—MADRAS PRESIDENCY: Nilgiri Hills, *Perrottet*, 1269; *Schmidt:* Kaity, *Hohenacker*, 933; Ootacamund, *Proudlock*. CEYLON: *Thwaites*, C. P. 1335; Bundarawalla, *Jowitt*.—Without indication of locality, *Wight*, 1705 (Herb. prop. 164).

OIL.—Not produced commercially. Yield 0·25 per cent. from the fresh (?) material. Composition unknown.

VERNACULAR NAMES.—Unknown.

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11. **Vetiveria zizanioides**, Stapf.—Transferred from *Phalaris* (*P. zizanioides*, L.).

DESCRIPTIONS.—Hackel, Androp., p. 542 (under *A. squarrosus*, var. *genuinus*); Hook. f., Fl. Brit. Ind., vol. vii., p. 186 (under *A. squarrosus*).

ILLUSTRATIONS.—Pal. de Beauv. Agrost., tab. 22, fig. 10 (analys.); Duthie, Fodd. Grass. N. Ind., tab. 15; Duval Jouve, in Mém. Ac. Sc. Montpell. vol. vii. tab. 17, fig. 9 (anatomy of the leaf).

SYNONYMS.

Veliveria odorata, Virey in Journ. de Pharm., sér. i., vol. xiii. (1827), p. 499.

V. arundinacea, Griseb. Fl. Brit. W. Ind. (1864), p. 559.—Based on West Indian specimens (from Jamaica and Trinidad).

V. muricata, Griseb. l.c., p. 560.—Transferred from *Andropogon* (*A. muricatus*, Retz.).

Phalaris zizanioides, Linn. Mant. Alt. (1771), p. 183.—Based on Koenig's S. Indian specimens. Original in Herb. Linn.

Andropogon muricatus, Retz. Obs. vol. iii. (1783), p. 43.—Based on specimens collected by Koenig in South India.

A. festucoides, J. S. Presl in C. B. Presl, Reliq. Haenk., vol. i. (1830), p. 340.—Based on Luzon specimens collected by Haenke.

A. squarrosus, Hack. Androp. (1889), p. 542 (var. *genuinus*), non L. f.

Agrostis verticillata, Lam. Ill. Gen., vol. i. (1791), p. 162.—From specimens "Ex. India, Ins. Franciae."

Anatherum muricatum, Beauv. Agrost. (1812) Expl. planch., p. 15.—Transferred from *Andropogon* (*A. muricatus*, Retz.).

DISTRIBUTION.—Tropical and sub-tropical India, Ceylon, and Burma, mainly near water, occasionally cultivated, as it also is in Malaya, the Mascarenes, the West Indies, and Brazil.

HERBARIUM SPECIMENS EXAMINED.—No particular localities quoted, the grass being well known and not easily mistaken.

OIL.—(Oleum Andropogonis muricati; Vetiver oil.)—Mostly produced in Europe from imported roots, also in Réunion. Yield 0·4–0·9 per cent from the dry root. Composition unknown. Specific gravity 1·015–1·030 at 15° (German oil), 0·982–0·998 at 30° (Réunion oil). Angle of rotation, α_D = + 29° (German), + 36° (Réunion).

VERNACULAR NAMES.—*Sanskrit:* Bālā (Suśruta), Usira (Suśruta), Viranam (Mahabharata). *Marathi:* Vālā (Moodeen Sheriff, 1869), Ushir (Dymock). *Gujerati:* Való (Moodeen Sheriff, 1869). *Hindustani:* Vālā, Bālā (Watt, 1889), Usirbedh (Pharmacogr. Ind., 1893), Biran (the stems, Duthie, 1888); Panni (Panjab, Duthie, 1883); Gander or Gandel (Duthie, 1888). *Bengali:* Bālā (Watt, 1889); Bena (Duthie, 1883). *Persian:* Bikh-i-Wala (Makhzan el Adwiya, 1771). *Tamil:* Vetti-ver (Koenig; Roxburgh). *Telugu:* Vatti veru (Elliot, 1859); Avura ġaddi (Elliot, 1859); Ouru (Elliot, 1859). *Canarese:* Bālāldḍe

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hullu (Stolz, 1882); Bálad véru (Pharmacogr. Ind., 1893); Mudivala hullu (Stolz, 1882). *Malayalim:* Ramacham (Rheede, 1703). *Tulu:* Mudyala (Stolz, 1882). *Singalese:* Savandra (Hermann, 1670–77). *Malay:* Akar wangi (literally, fragrant root). *Burmese:* Miya-móa (Moodeen Sheriff, 1869). *Spanish:* Yerba Moro, Raiz de Moro (Blanco; Philippines). The Anglo-Indians call it "Khas-Khas" (Jones, 1795), the derivation of which is uncertain.

12. **Andropogon odoratus**, *Lisb.* in Journ. Bomb. Nat. Hist. Soc., vol. iv. (1889), p. 123, with plate.—Based on specimens collected by Mrs. Lisboa near Lanowli, Bombay Presidency.

DESCRIPTIONS.—Lisboa, l.c. and vol. vi., p. 68 and p. 203; Hook. f., Fl. Brit. Ind., vol. vii., p. 177.

ILLUSTRATION.—Lisboa, l.c., vol. iv., plate opposite p. 118 (bad).

SYNONYMS.—None.

DISTRIBUTION.—Bombay; Thana and Poona Districts.

HERBARIUM SPECIMENS EXAMINED.—BOMBAY PRESIDENCY: Thana District, near Thana, *Dymock*; Lanowli, *Lisboa*; Puna District, Mawal, *Woodrow*.

OIL.—Not produced commercially. Composition unknown. Specific gravity, 0·931 (Dymock), 0·915 (Schimmel & Co.). Angle of rotation α_D: $-22{\cdot}75°$ (Dymock), $-23°\ 10'$ (Schimmel & Co.).

VERNACULAR NAMES.—*Marathi:* Veddi gavat (Lisboa); Usadhana (Watt, 1889).

EXPLANATION OF THE PLATE.

Cymbopogon citratus, *Stapf.*—Fig. 1, entire plant; 2, end of rhizome with tuft of sheaths; 3, upper leaves of a barren tuft; 4, part of an inflorescence; 5, pair of spikelets; 6, sessile spikelet; 7, outer (lower) glume; 8, valve (glume III.) of lower (barren) floret; 9, valve (glume IV.) of upper (fertile) floret; 10, outer (lower) glume of pedicelled spikelet.—Fig. 1, *much reduced*; 2–4, *of natural size*; 5–10, *enlarged*.

XLVII.—MISCELLANEOUS NOTES.

Cultivation of Citronella Grass in Java.—While Dr. Stapf's account of the Oil-grasses of India and Ceylon has been passing through the press various references to the industry involved have appeared in current journals. One of these, taken from the *Agricultural News*, vol. v., p. 335, is derived from a report by the Hon. Staniforth Smith, of the Australian Parliament, and refers to the cultivation of Citronella Grass in Java:—

"From Citronella Grass (*Andropogon Nardus*) a valuable scented oil is obtained that is used in the manufacture of superior soaps and other articles. In Java there are several large plantations—one of those I inspected being nearly 1,000 acres in extent.

"The grass, if planted in good fertile soil, and enjoying a heavy rainfall, grows very quickly. From 10 acres a yield of 12 tons should be cut, and four corps a year can be taken off, totalling 48 tons. This will yield about ½ per cent. of oil, or 4¼ cwt., worth 3*s.* 10*d.* a kilogramme, say £46 16*s.* The grass lasts twelve

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years before it is necessary to plant again. To obtain the oil from the grass by distillation a small plant is required, consisting of one boiler costing £250, and a tank and condenser with pipe connection, costing £85. A round tank, 16 feet in diameter, would be sufficiently large to treat four crops a year off 200 acres, if worked day and night.

"While I would not recommend this as a principal crop in Papua, I think it should be cultivated, as in Java, as a catch-crop between the rubber and cocoa-nut trees."

Cultivation of Lemon Grass in the Malay Peninsula.—A second notice of the cultivation of a scented oil-grass, in the *Times of Malaya*, is here reprinted from the *Agricult. Bulletin, Straits and Federated Malay States*, vol. v. (given as viii.), pp. 282, 283.

The most remarkable feature in this reference to Lemon Grass cultivation is the great difference of view as to the yield expected as compared with that anticipated from Citronella Grass. The latter is supposed to be likely to give four crops a year, the former only two. Yet the produce of these four crops of Citronella Grass from ten acres is expected to realize only £46 16*s.* as against £266 13*s.* 4*d.* per acre from the two crops of Lemon Grass. The cultivation of Citronella Grass is only advocated as a catch-crop, but even on this assumption the first estimate seems low; the second is probably too high. The note is as follows:—

"A product for which there is at present a good demand in the London market, late quotations being from 8¼*d.* to 8½*d.*, is the oil of Lemon Grass. The value of the product has steadily increased from a trifle over Rs. 40 to Rs. 58 per gallon, and is likely to rise higher in the near future.

"Lemon Grass luxuriates in a well-drained sandy soil, but has been known to thrive also upon laterite provided the dry weather be not prolonged. It is also a lover of moisture in the soil but is unable to withstand waterlogging. For the highest purposes of its cultivation, however, the most suitable soil is an arenaceous clay, and the best climate one which presents distinct alternations of sunshine and shower.

"The crop will, under ordinary conditions, be ready for harvesting in the cold weather of the third year from planting it out. On cropping the grass it is committed to the still with as little delay as possible. The usual method adopted with the grass is aqueous distillation in copper stills. In plantation-grown grass at least two crops can be harvested in the season, so that, calculating on an average on a bundle of the grass (of six inches diameter) from each of the 5,000 clumps which may safely be counted upon to attain to maturity out of the 7,260 planted out, the yield of an acre may be estimated at 10,000 bundles. Fifty such bundles yield a quart (40 fluid ounces) of the oil, so that the 10,000 bundles would yield 200 quarts or 8,000 ounces. Valued at 8*d.* per ounce, which is the current average selling price of the oil in the London market, the produce of an acre would realise £266 13*s.* 4*d.* Even should the crop cost £66 13*s.* 4*d.* to raise, tend, harvest, distil and transport the oil to market, a profit of £200 per acre would be obtainable from it from and after the cold weather of the third year of its establishment."

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ROYAL BOTANIC GARDENS, KEW.

BULLETIN

OF

MISCELLANEOUS INFORMATION.

No. 9.] [1906.

XLVIII.—A NEW FRUIT FROM URUGUAY.

(*Pouteria suavis*, Hemsl.)

In July of the present year, Kew received from the Editor of 'Il Giardinaggio' (an Italian horticultural journal, published in Turin) leaves, fruit and seeds of a South American tree, asking whether it was known to science. This material was supplemented by a paragraph from 'Il Giardinaggio' of which the following is a translation :—

"Mr. E. Frosio, a horticulturist of Paysandu, Uruguay, in a private letter received by the 'Il Giardinaggio,' sends the following interesting note, which we think our readers will like to see :

"'There is a plant bearing a fruit and having persistent leaves, which is certainly endemic in the islands of the Uruguay River and is so peculiar that nobody has yet been able to classify it. The general appearance of the plant is that of a laurel, with leaves which are green and shining on the upper surface. The fruit is about the size of an apricot, but of the shape of an apple ; it is yellow and scarlet when mature and possesses a perfume so delicate that it is equalled in no other fruit. The seed is like a large hazel-nut, but the edible fleshy part of the fruit is small ; it has, however, an extremely agreeable taste and possesses such a remarkable digestive property that when the aborigines have over-indulged, they eat freely of this before lying down at night and then they sleep 'like a child' and wake up the next morning with a clear head and a wonderful appetite.'"

The leaves of this plant agree exactly with those of a specimen in the Kew Herbarium, collected by Dr. P. G. Lorentz in Concepcion del Uruguay, in 1878, and wrongly named *Lucuma gardneriana*, A. DC. (syn. *Pouteria gardneriana*, Radlk.). *Lucuma gardneriana* was collected between Angrias and Saõ Gonsalvo, in Piauhy, about 1,750 miles north of Concepcion del Uruguay, and Lorentz's specimen is certainly different, though closely allied.

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There is also in the Kew Herbarium a small flowerless branch collected in Uruguay by John Tweedie, of what is apparently the same species. Tweedie sailed up the river Uruguay about the year 1833, and probably botanised in the islands. The following note accompanies the specimen :—"This is called among the natives of the Uruguay *aguya*. It is one of the most splendid evergreen trees I have met with, and the fruit, resembling a golden knob pear, has a finer scent than the pine-apple. The two fruits sent are bad specimens." These fruits have disappeared, but those sent by the Editor of 'Il Giardinaggio' are pear-shaped.

Pouteria suavis, *Hemsl.* [Sapotaceae] ; species nova ex affinitate *P. gardnerianae*, a qua foliis angustioribus lanceolatis, floribus dimidio minoribus et sepalis subaequalibus interioribus haud truncatis emarginatis differt.

Arbor ramis floriferis rectis graciliusculis appresse-sericeis. *Folia* glabra, in ramorum apicibus conferta, demum coriacea, breviter petiolata, anguste oblonga, oblanceolata vel lanceolata, 4–15 cm. longa, saepius circiter 10 cm. longa, 1–2·5 cm. lata, apice obtusa vel rotundata, basin versus attenuata, supra nitida conspicue venosa. *Flores* circiter 3–4 mm. diametro, infra folia ad foliorum delapsorum axillas fasciculati, numerosi, pedicellis sericeis 3–4 mm. longis. *Sepala* 4, biseriata, 2 omnino interiora, similia, ovata, concava, extus sericea, ciliolata. *Corolla* fere ad medium 4-lobata, lobis rotundatis erectis ciliolatis. *Staminodia* oblonga, ciliolata, corollae lobis alterna iisque dimidio breviora. *Stamina* corollae lobis isomera et iis opposita, inclusa. *Ovarium* villosum, 2-loculare (an semper ?) stylo glabro brevissime exserto. *Fructus* pyriformis, 4–5 cm. longus, medio 2·5–2·75 cm. diametro, glaber, pericarpio carnoso tenui. *Semina* saepius 2, semiovoidea, vel 1, ovoideum, testa crassa, ossea.

Steps have been taken to establish this tree at Bordighera, where seeds have been sown in Mr. Garnier's garden. Under cultivation the fleshy part of the fruit may possibly be so increased as to render it acceptable to a circle outside the aborigines of Uruguay.

W. B. HEMSLEY.

XLIX.—MARINE ALGAE FROM COREA.

We have to-day a good general knowledge of the land flora of Corea, but of the marine vegetation our knowledge is meagre in the extreme. With the exception of Okamura's list of algae from Fusan (Tokyo Bot. Mag. vol. vi., p. 117) and the records of a few stray algae (mostly floating Sargassums) picked up by naturalists and others, we have no information on the subject.

It is therefore satisfactory to have opportunities of examining specimens freshly collected and dried by residents in the country. During the past year Mrs. H. G. Brand and Mrs. Sydney Wakefield have forwarded four small dried collections from Fusan and Wonsen respectively. An examination of these shows that the coast of Corea is not by any means poor in marine vegetation, and will amply repay the time and trouble spent in collecting. This

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is rendered evident by the following notes. Two packets of about 20 species each were sent during 1905 from Wonsen, and, with the exception of two species, none of the plants in the two packets were the same. In supplies from Fusan only three species were found which were included in the Wonsen list. Okamura's list above referred to is found to be again very different. The marked dissimilarity in these collections shows therefore that there is a considerable variety in species, and that before an adequate idea of the marine vegetation of the country as a whole can be formed, a much larger supply of material is necessary, not only from various localities, but collected at different seasons of the year. In some cases the material sent was insufficient for identification, and in not a few instances the generic names only could be given. The omission of these from the list, and also of certain critical species, will account for the number of names being somewhat smaller than might be expected.

The algae received from Corea resemble, as one would expect, those of Japan—the only eastern country of which the marine flora is well known. Besides including some of the most interesting Japanese species, the packets sent contained several plants which have not hitherto been recorded from Japan, and others which are entirely new.

The recording of several critical species of which no authentic specimens exist in this country, and as to which further information is desirable, is for the present postponed.

Codium mucronatum, *J. Ag.*, var. **californicum**, *J. Ag.;* De Toni Syll. Alg. vol. i., p. 495.

Wonsen, Feb. 1905, *Wakefield.*

The Corean specimens, like those known from Japan, resemble the Californian variety of *Codium mucronatum* rather than the Australian.

DISTRIBUTION. Var. *tasmanicum*, J. Ag. Australia, Tasmania. Var. *californicum*, J. Ag. California, Sitka, Japan.

Bryopsis plumosa, *Ag.;* De Toni Syll. Alg. vol. i., p. 431.

Fusan, Jan. 1905, *Brand.*

DISTRIBUTION. Cosmopolitan.

Sargassum Horneri, *Ag.;* De Toni Syll. Alg. vol. iii., p. 20.

Fusan, Jan. 1905, *Brand.*

A very distinct *Sargassum*, and one not readily confused with other species.

DISTRIBUTION. Japan, Corean Strait.

Sargassum tortile, *Ag.;* De Toni Syll. Alg. vol. iii., p. 23.

Wonsen, Jan. 1905, *Wakefield.*

Plants agree well with the original specimens from Nagasaki in Herb. Turner, at Kew: Turner, Hist. Fuc. vol. ii., p. 88, tab. 104, fig. b.

DISTRIBUTION. Japan.

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Cystophyllum Thunbergii, *J. Ag.*; De Toni Syll. Alg. vol. iii., p. 157.

Wonsen, Feb. 1905, *Wakefield.*

DISTRIBUTION. China, Japan.

Cutleria cylindrica, *Okam.*; Illust. of the Mar. Alg. of Japan, vol. i., Tokyo, 1902, plate 28.

Fusan, Jan. 1905, *Brand.*

This very interesting plant, fully described and figured by Okamura, bears in its general appearance a strong resemblance to *Stilophora rhizoides*, J. Ag. The reproductive organs are, however, those of the *Cutleria* type.

The striking difference between the present plant and the two well-known species of *Cutleria* is the possession of cylindrical shoots showing radial structure; this has the effect of making it appear a very distinct plant and one almost worthy of generic rank. The filamentous tissue of the axis is also a point of considerable importance. Dr. Okamura has had, however, an opportunity of examining living material, and he considers it a *Cutleria* with radial symmetry. He was unable to observe the escape of the female gametes, but presumably these are similar to those of *C. multifida.* The asexual (Aglaozonial) stage is not yet known, and it will be of much interest to see how this compares with that met with in the other species of *Cutleria.*

DISTRIBUTION. Japan.

Gelidium latifolium, *Bornet*; De Toni Syll. Alg., vol. iv., p. 150.

Wonsen, Oct. 1905, *Wakefield.*

Tetrasporic examples were sent.

DISTRIBUTION. N Atlantic, Mediterranean.

Gelidium australe, *J. Ag.*; De Toni Syll. Alg. vol. iv., p. 153.

Wonsen, Oct. 1905, *Wakefield.*

The specimens sent were of medium size bearing either tetraspores or cystocarps; they agree well with Harvey's Australian plants. Hitherto only known from Australia.

DISTRIBUTION. Australia.

Gigartina tenella, *Harv.*; De Toni Syll. Alg. vol. iv., p. 201.

Wonsen, Oct. 1905, *Wakefield.*

Agrees very closely with Okamura's Algae Japonicae Exsiccatae No. 9.

DISTRIBUTION. Japan.

Gymnogongrus japonicus, *Suhr.*; De Toni Syll. Alg. vol. iv., p. 248.

Wonsen, Oct. 1905, *Wakefield.*

The Corean specimens resemble Suringar's figure, Alg. Jap. t. 24A, but being somewhat less tufted they are also not unlike *G. divaricatus*, Holmes. Mr. Holmes has allowed me to examine

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his original specimens, and the Wonsen plants are found to differ from the latter in the forking being less divaricate and in the absence of the dense proliferations from the branches.

DISTRIBUTION. China, Japan.

Ahnfeltia plicata, *Fr.;* De Toni Syll. Alg. vol. iv., p. 254.

Wonsen, Oct. 1905, *Wakefield.*

DISTRIBUTION. N. Atlantic, N. Pacific, Greenland, Kerguelen's Land, Falkland Islands.

Sterrocolax decipiens, *Schmitz;* De Toni Syll. Alg. vol. iv., p. 260.

Wonsen, Oct. 1905, *Wakefield.*

A number of small specimens present on *Ahnfeltia.*

DISTRIBUTION. Probably to be found wherever its host-plant, *Ahnfeltia plicata,* occurs.

Gracilaria corticata, *J. Ag.;* De Toni Syll. Alg. vol. iv., p. 448.

Fusan, Jan. 1905, *Brand;* Wonsen, Oct. 1905, *Wakefield.*

Fine fruiting plants with cystocarps were received. The species would appear to be common in both localities; there is no record of its having yet been found in Japan.

DISTRIBUTION. Indian Ocean, Red Sea.

Plocamium coccineum, *Lyngb.*, var. **uncinatum,** *J. Ag.;* De Toni Syll. Alg. vol. iv., p. 591.

Fusan, Jan. 1905, *Brand.*

The Corean specimens agree very closely with this variety, which is found in the Mediterranean.

DISTRIBUTION. *P. coccineum* cosmopolitan, var. *uncinatum,* J. Ag.; N. Atlantic, Mediterranean.

Plocamium nobile, *J. Ag.;* De Toni Syll. Alg. vol. iv., p. 593.

Fusan, Jan. 1905, *Brand.*

DISTRIBUTION. Cape of Good Hope.

Laurencia paniculata, *J. Ag.;* De Toni Syll. Alg. vol. iv., p. 788.

Wonsen, Feb. 1905, *Wakefield.*

DISTRIBUTION. N. Atlantic, Mediterranean, Japan.

Laurencia obtusa, *Lamour.*, var. **rigidula,** *Grunow;* De Toni Syll. Alg. vol. iv., p. 793.

Wonsen, Feb. 1905, *Wakefield.*

The compact, sturdy little plant received is very distinct in appearance from the common forms of *L. obtusa.* It agrees, however, in its main points with the description of Grunow's Fijian variety *rigidula.* The characters at present employed in classifying Laurencias are so unsatisfactory that one is reluctant to add more forms or varieties to the list, which is already of excessive length.

DISTRIBUTION. *L. obtusa,* Cosmopolitan: var. *rigidula,* Grun., Fiji.

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Laurencia pinnatifida, *Lamour.*; De Toni Syll. Alg. vol. iv., p. 798.

Fusan, Jan. 1905, *Brand.*

A thin, loosely-branched form.

DISTRIBUTION. General throughout N. Atlantic and N. Pacific. (The varieties reported from the Southern Hemisphere are probably distinct species.)

Symphiocladia gracilis, *Falkenb.*; De Toni Syll. Alg. vol. iv., p. 990.

Wonsen, Feb. and Oct. 1905, *Wakefield.*

Several fronds of this plant were received in both the Wonsen gatherings. Though at present only known from Japan and China it is apparently common in those countries, having been recorded from numerous localities.

DISTRIBUTION. China, Japan.

Dasya collabens, *Hook. and Harv.*; De Toni Syll. Alg. vol. iv., p. 1208.

Fusan, Jan, 1905, *Brand.*

The Corean specimens are sterile, but in vegetative characters they agree in all respects with Lyall's New Zealand specimens.

DISTRIBUTION. New Zealand.

Ceramium tenuissimum, *J. Ag.*; De Toni Syll. Alg. vol. iv., p. 1450.

Chemulpo, Oct. 1904, *Brand.*

Several tufts of tetraspore-bearing plants were received.

DISTRIBUTION. N. Atlantic, N. Pacific, Tasmania.

Ceramium japonicum, *Okam.*; De Toni Syll. Alg. vol. iv., p. 1459.

Fusan, Jan. 1905, *Brand*; Wonsen, Feb. 1905, *Wakefield.*

Okamura described and figured this species in 1896. Though I have not seen an original specimen, there is little doubt that the plant may now be recorded from the above two localities in Corea.

DISTRIBUTION. Japan.

Ceramium hamatum, *Cotton*, sp. nov.

Wonsen, Feb. and Oct. 1905, *Wakefield.*

Videtur *C. rubro*, Ag., affine, a quo tamen ramis uncinatis recedit.

Frons ubique corticata, inferne subsetacea, immerse articulata, irregulariter dichotoma, sursum attenuata; *rami* biformes, quorum alii erecto-patentes, regulariter dichotomi, segmentis terminalibus forcipatis, alii simplices 'incrassati' uncinati. *Color* roseo-purascens. *Fructus* ignotus.

In its uncinate branches this plant resembles *Campylaephora hypneoides*, J. Ag., of which I at first thought it might prove to be a small and slender form. The thick cortical layer and large

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internal cells characteristic of that genus are however entirely absent. The structure on the other hand is that of a corticated *Ceramium* to which genus it undoubtedly belongs. From the dried material it appears to be a rather delicate and fragile species, not unlike in general appearance some of the slender forms of *C. rubrum*. Owing to the absence of tetrasporic plants it is impossible to say in which section of the genus it should be placed.

This plant has been twice received from Wonsen, but on both occasions the specimens were sterile. *Campylaephora hypneoides* also, is only known in the sterile state; tetraspores have been recorded as occurring in the swollen branches, but this has not been confirmed, and it certainly is not usually the case.

Ceramium rubrum, *Ag.*; De Toni Syll. Alg. vol. iv., p. 1476.

Wonsen, Feb. and Oct. 1905, *Wakefield*.

Numerous tufts of a form of this cosmopolitan species were found mixed with, or epiphytic upon, the larger algae.

DISTRIBUTION. Cosmopolitan.

Ceramium Boydenii, *Gepp*, Journ. of Bot. vol. xlii., 1904, p. 164, plate 460, fig. 1–3.

Wonsen, Oct. 1905, *Wakefield*.

A most distinct species, described two years ago by Mrs. Gepp, from China and Japan. The Corean plants agree in all general characters and show the tetraspores borne in the same irregularly shaped ramuli. Their whole appearance tends to confirm Mrs. Gepp's suggestion that this species has a creeping habit.

DISTRIBUTION. Japan, China.

Grateloupia divaricata, *Okam.*; De Toni Syll. Alg. vol. iv., p. 1570.

Wonsen, Oct. 1905, *Wakefield*.

As remarked by Okamura this alga is intermediate in form between *G. filicina*, Ag., and *G. dichotoma*, J. Ag., though it would appear to be much more nearly related to the former than the latter. To the typical forms of *G. dichotoma*, such as are found on the S.W. coast of England and in the Mediterranean, it bears little resemblance, the latter plant possessing repeatedly forked branches which are quite devoid of the tetraspore-bearing proliferations that are characteristic of Okamura's plant. *G. dichotoma* is also much smaller and its dichotomy is more regular. Several tropical plants, notably in Mazé's Algae Guaduloupenses, have been referred to varieties of *G. dichotoma* and to these the Japanese plant bears more resemblance, but after careful examination these cannot be regarded as the same species as that described by Agardh.

On the other hand *G. divaricata* shows resemblance in general appearance and size with *G. filicina*, Ag., and also in the position of the tetraspores, but it differs in the more or less frequent forkings of its branches. In the Corean specimens the forkings are at wide intervals, though the apices of all the main branches are bifid. As in Okamura's specimens the tetraspores appear to be confined to the proliferations.

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Okamura remarks that this species has only been found on the west side of Japan and not on the Pacific coast.

DISTRIBUTION. Japan.

Prionitis elata, *Okam.*; De Toni Syll. Alg. vol. iv., p. 1590.

Wonsen, Feb, 1905, *Wakefield.*

Several fine specimens were received. Though no fruit was to be found there can be no doubt as to the identity of the plant.

DISTRIBUTION. Japan.

Dumontia simplex, *Cotton*, sp. nov.

Wonsen, Feb. 1905, *Wakefield.*

D. filiformi, Grev., affine, a qua frondibus simplicibus recedit.

Frondes plures a basi parva scutata, simplices spathulato-lineares, versus basin in stipitem filiformem attenuatae, gelatinosae. *Cystocarpia* immersa, minuta, per totam fere superficiem sparsa, carposporis majusculis; tetrasporangia immersa, sparsa, cruciatim divisa.

In the specimens received, four or five fronds grow from the minute disk, these taper gradually towards the base, till near the disk the frond is filiform. The plants are 10–12 cm. in height and are apparently full-grown, as they are liberally provided with either tetraspores or cystocarps. The broadest part of the frond is 2–3 cm. from the apex and measures about 1 cm. across. The fronds are apparently very much compressed, with a more or less blunt apex. The specimens adhere very strongly to paper.

The internal structure of the frond is filamentous, and shows no divergence from the usual *Dumontia* type. The large tetraspores are densely scattered in the cortical layer throughout the whole of the upper part of the frond. The cystocarps are similar to those of *D. filiformis*, the carpospores being few but of large size, frequently measuring 80 micromillimeters in length.

Of the various species of *Dumontia* which have been described, *D. filiformis*, Grev., is the only one which is satisfactorily known. Many have been referred to other genera. *D. furcata*, Post & Rupr. (North Pacific), and *D. cornuta*, Hook. & Harv. (Antarctic), are still retained in the genus, but their position is doubtful. Both these species, together with *D. filiformis*, differ from *D. simplex* in their branched habit.

The Japanese plant named by Suringar, *Schyzimenia? ligulata* (Alg. Jap., p. 29, tab. xv.), somewhat resembles *D. simplex*, but differs in frequently being branched. Schmitz (Nuovo Notarisia, 1894, p. 634), however, examined the original material and came to the conclusion that the plant was a *Grateloupia*.

The following additional species from Corea were found unnamed in Sir William Hooker's herbarium now preserved at Kew:—

Pterocladia capillacea, *Bornet*; De Toni Syll. Alg. vol. iv., p. 162.

Port Hamilton, *Wilfred*, No. 728.

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Cystocarps not present, but the plant agrees well in general appearance with European specimens of this species.

DISTRIBUTION. Cosmopolitan. (Apparently cosmopolitan, cystocarpic plants being rare, certain identification is in some cases difficult.)

Champia parvula, *J. Ag.*; De Toni Syll. Alg. vol. iv., p. 558.

Port Hamilton, *Wilfred*, No. 728.
Specimens bearing tetraspores.

DISTRIBUTION. N. Atlantic, Mediterranean, Indian Ocean, N. Pacific, Australia.

Gloiopeltis tenax, *J. Ag.*; De Toni Syll. Alg. vol. iv., p. 1533.

Corea, June, 1859, *Wilfred*.

DISTRIBUTION. China, Japan.

Grateloupia filicina, *Ag.*; De Toni Syll. Alg. vol. iv., p. 1563.

Port Hamilton, *Wilfred*, No. 730.

DISTRIBUTION. N. Atlantic, Mediterranean, West Indies, Indian Ocean, Japan.

A. D. COTTON.

L.—BARWOOD.

(*Pterocarpus Soyauxii*, Taub.)

The subject of the red dye-wood or woods, formerly of considerable commercial importance, known commercially as Barwood, is one that has occupied the attention of Kew for a considerable number of years. The matter has not been finally settled, because apparently more than one species is involved, and possibly also in trade circles the name has been at times misapplied. One species, *Pterocarpus Soyauxii*, Taub., has, however, been definitely found to be the source of at least part of the Barwood of commerce. The following note, in which a resumé is given of the knowledge attained, is issued with the double object of making that knowledge available and of inviting the communication of the material required to clear up the points that are still obscure.

Barwood is a product of the West Coast of Africa. According to Holtzapffel (*Descriptive Catalogue of Woods* [1852], p. 73) :—"Two kinds of Barwood are imported from Angola and Gaboon respectively, in split pieces 4 to 5 ft. long, 10 to 12 ins. wide, and 2 to 3 ins. thick. It is used as a red dye-wood; the wood is rather dark red, but the dye rather pale; it is also used for violin bows, ramrods, and turning."

Owing to the confusion that existed in the literature bearing on Barwood and on Camwood—another West African dye-wood, which has been satisfactorily identified as *Baphia nitida*, Afz. (*Leguminosae*)—and from the fact that some writers had considered Barwood and Camwood to be derived from the same tree, an application was made by Kew to the Colonial Office in October, 1890, soliciting the co-operation of the Governors of the Gold Coast, Sierra Leone, and Lagos in an effort to settle the question.

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As a result of this application a specimen of Barwood from the river Prah, in the district of Chawa, Gold Coast, was received at Kew. The herbarium material which accompanied the specimen was imperfect. It was therefore impossible to determine accurately the tree which had furnished the wood, but from the structure of the latter and the absence of colour it was readily seen that, whatever the species might be, there was no similarity between its wood and that of ordinary commercial Barwood. A sample of Camwood, received at the same time, proved to be really the produce of *Baphia nitida*, Afz.

As regards Lagos, the specimens of Barwood sent to Kew agreed with the "Camwood" of the Gold Coast in having been yielded by *Baphia nitida*. It is therefore clear that at times the one product may be mistaken, in trade circles, for the other.

The Travelling Commissioner of Sierra Leone sent specimens of two woods unaccompanied by herbarium material. One of these was labelled Camwood, *vern.* "Bundoi"; this agrees with specimens in the Museum known to be the wood of *Baphia nitida*, Afz. The other was sent as Konta Wood, *vern.* "Pendeh"; this bears no resemblance to either Barwood or Camwood; it has been determined by Mr. G. F. Scott-Elliott as probably the wood of *Berlinia auriculata*, Benth. (*Leguminosae*). Later, at the request of the Travelling Commissioner, a sample of commercial Barwood was forwarded to Sierra Leone, so that he might study its appearance and characters. The result of the Commissioner's further endeavours to clear up the difficulty is given in a letter from him dated 10th July, 1903:—"I have for a long time endeavoured to discover a wood which would approximate in colour and other details to the specimen of Barwood submitted to me, but although I have employed an American sawyer to seek for it in the bush, and have shown the specimen to many Chiefs and others, I have not been successful in finding anything which in any way compares with it, nor does the wood appear to be known."

Gaboon is the chief source of Barwood, or Redwood as it is sometimes termed, and there is now hardly room for doubt that, so far as Gaboon is concerned, the species which yields the product is *Pterocarpus Soyauxii*, Taub. (*Leguminosae*). This species has been figured in *Hooker's Icones Plantarum*, vol. xxiv., t. 2369 (1895), and is there described as a tree of the virgin forest, reaching a height of 80–90 ft., and yielding the Barwood or Redwood employed by the natives as a dye. With the description Professor D. Oliver has given the following note:—"Our specimens of *P. Soyauxii*, Taub., were collected by Soyaux and are labelled 'Red- or Barwood of the traders.' The confusion hitherto existing in this case—as in so many parallel instances in which dye-woods or other products of economic value are concerned—between the plant here figured and allied species of *Pterocarpus* and Camwood, *Baphia nitida*, Afz., may now be regarded as satisfactorily cleared up."

An excellent instance of the confusion, to which Professor Oliver alludes, between allied species of *Pterocarpus* is met with in the case of Angola Barwood, as to the botanical origin of which there is still some doubt, though it is probable that it is derived from *Pterocarpus tinctorius*, Welw., a tree 40 to 70 ft. high, which

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is described in the *Flora of Tropical Africa* as having a hard red or white wood, and as being widely distributed in Angola. In the *Catalogue of Welwitsch's Plants*, pt. i., p. 277, it is stated that the wood of this species is valuable, of a blood-red colour yielding a red dye, and of much use for carpenters' work. While, however, it appears to be widely employed in Angola as a dye, there is nothing to indicate that it is an article of export.

From personal enquiries recently made in Liverpool, it appears that for the past few years Barwood has been practically unsaleable in this country, and at the present time may be obtained for £2 15*s.* per ton.

With regard to Camwood, this is still imported in small quantities, that known as "Grand Bassa," from Liberia, being considered the best quality; the next in importance comes from Sherboro, Sierra Leone. Inferior varieties are shipped from Gaboon and Old Calabar.

Examples of the products referred to in this note are to be seen at Kew in Museum No. I., cases 36 and 37.

J. M. H.

LI.—NEW ORCHIDS: DECADE 29.

281. **Dendrobium convolutum**, Rolfe; aff. *D. chloroptero*, Reichb. f. et S. Moore, sed floribus majoribus, petalis et labelli lobis lateralibus latioribus distinctum.

Pseudobulbi clavati, circa 22 cm. longi, 14 mm. lati, apice diphylli. *Folia* . . .? *Scapus* gracilis, terminalis, 12–15 cm. longus, 4-florus. *Bracteae* triangulares, acutae, 5 mm. longae. *Pedicelli* glabri, 2·5 cm. longi. *Sepala* glabra, triangulari-ovata, acuta, carinata, 16–18 cm. longa, lateralia in mentum obtusum, 6–8 mm. longum extensum. *Petala* elliptico-oblonga, subacuta, basi angusta, sepalis angustiora. *Labellum* trilobum; lobi laterales late oblongi, obtusi, columnam involventes, apice imbricati; lobus intermedius reniformis, apiculatus, subconduplicatus; discus medius valide bicallosus, pone tricarinatus. *Columna* lata, 2 mm. longa, apice tridentata.

NEW GUINEA.

Flowered with Messrs. Sander & Sons, in November, 1898, and afterwards with Sir Trevor Lawrence, Bart. The sepals and petals are light green, with a few small dark brown markings at the base, the side lobes of the lip are green with dark brown radiating nerves, and the disk and front lobe dark brown, the latter passing into green at the margin.

282. **Coelia densiflora**, *Rolfe;* a *C. Baueriana*, Lindl., racemo densifloro, ovario exalato, et mento evoluto facile distinguenda.

Pseudobulbi ovoidei, apice subattenuati, circa 7 cm. longi, 3 cm. lati. *Folia* lanceolata, acuta, subcoriacea, circa 30 cm. longa, 3 cm. lata. *Scapi* abbreviati, crassi, 6–7 cm. longi, basi vaginis numerosis ovatis acuminatis imbricatis obtecti. *Racemi* ovoidei,

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breves, densiflori. *Bracteae* lanceolatae, acuminatae, membranaceae 1·5–2 cm. longae. *Pedicelli* 5–8 mm. longi. *Flores* numerosi, albi, circa 1·3 cm. longi. *Sepalum* posticum lanceolato-oblongum, acutum, concavum, 8–10 mm. longum; sepala lateralia similia sed basi columnae pedi adnata, mentum oblongum formantia. *Petala* lanceolata-oblonga, acuta, 8–10 mm. longa. *Labellum* 1 cm. longum, basi angustum, subattenuatum, supra medium dilatatum et laeviter trilobum, lobis lateralibus rotundatis, lobo intermedio deltoideo obtuso, disco laevi. *Columna* clavata, 8 mm. longa. *Mentum* oblongum, saccatum, 5 mm. longum.

CENTRAL AMERICA.

Four species of *Coelia* have hitherto been described, all natives of Central America, but a fifth has now flowered at the Royal Botanic Gardens, Glasnevin, Mr. Moore having obtained it from Messrs. John Cowan & Co., without record of its origin. There is, however, a single inflorescence, with sketch of a flower, in Lindley's Herbarium, labelled "Guatemala, Skinner," which is so substantially identical as to leave little doubt that it belongs to the same species, though it has not been utilised in preparing the above description. The flowers of the living plant are white, with a light yellow anther case.

283. **Oncidium Claesii**, *Rolfe*; affine *O. tenensi*, Reichb. f., sed floribus majoribus, segmentis acutioribus, labelli lobis lateralibus rotundatis nec angulatis differt.

Herba epiphytica, scandens. *Caules* robusti, vaginis membranaceis imbricatis tecti. *Pseudobulbi* 25–30 cm. distantes, oblongi, circa 10 cm. longi, apice diphylli, basi circa 4-phylli. *Folia* ligulata, subacuta (immatura solum vidi). *Scapi* robusti, volubiles, ramosi, 3·5–5·5 m. longi, multiflori. *Bracteae* ovatae, obtusae, valde concavae, 7–10 mm. longae. *Flores* speciosi. *Sepala* unguiculata, elliptico-ovata, apice subtorta et obtusa, paullo undulata, 3·5–4 cm. longa, lateralia subobliqua. *Petala* late unguiculata, ovata, apice falcato-recurva, circa 2·5 cm. longa. *Labellum* trulliforme, apice subattenuatum et obtusum, circa 1·8 cm. longum, 1 cm. latum; crista carnosa, tuberculata, lamellis tribus in fronte verrucisque pluribus utrinque prope basin instructa. *Columna* clavata, fere 1 cm. longa, alis obsoletis.

COLOMBIA. *Claes.*

A striking species, introduced to cultivation by M. Fl. Claes, Etterbeek, Brussels, who describes the inflorescence as 12 to 18 feet long, entangled and twisted round the branches of a shrub, and bearing numerous large flowers with chocolate-red sepals, the petals and lip deep carmine, tinged with violet, and the crest yellow.

284. **Gomesa scandens**, *Rolfe*; a species reliquis caule elongato scandente, pseudobulbis distantibus apice monophyllis differt.

Caulis elongatus, scandens, radicans, vaginis imbricatis obtectus. *Pseudobulbi* distantes, elliptico-oblongi vel oblongi, 2·5–4 cm. longi, apice monophylli, basi diphylli. *Folia* patentia, oblonga, subacuta, 6–11 cm. longa, 1–3 cm. lata. *Scapi* axillares, recurvi, 12–22 cm. longi, multiflori. *Bracteae* lineari-lanceolatae, acutae,

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4–8 mm. longae. *Sepalum* posticum lanceolatum, acuminatum, circa 8–10 mm. longum; sepala lateralia similia, ad medium connata, *Petala* lanceolata, acuminata, 8–10 mm. longa. *Labellum* recurvum, ovato-lanceolatum, acuminatum, circa 8–10 mm. longum, medio bicristatum, cristis undulatis. *Columna* clavata, 6 mm. longa, alis angustis.

BRAZIL. *Binot;* Environs of Rio de Janeiro, *Glaziou*, 14,303.

Sent to Kew in 1902 by M. Binot, and flowered in the collection in July of the following year. The flowers are greenish-yellow, as in the allied species, from all of which it differs in its scandent habit.

285. **Trigonidium subrepens,** *Rolfe;* affine *T. tenui*, Lodd., pseudobulbis majoribus, foliis latioribus, et sepalis latioribus distinctum.

Rhizoma subrepens, validum. *Pseudobulbi* subdistantes, oblongi, subcompressi, lateribus obscure tricostati, 2·5 cm. longi, monophylli, basi vaginis membranaceis triangulari-ovatis obtecti. *Folia* ligulata, subobtusa, circa 15–17 cm. longa, 1–1·3 cm. lata, subcoriacea. *Scapi* subgraciles, circa 15–17 cm. longi, vaginis numerosis lanceolatis imbricatis obtecti. *Bracteae* lanceolatae, acuminatae, apice carinatae, circa 3 cm. longae. *Sepalum* posticum rhomboideo-oblanceolatum, apice acuminatum et recurvum, circa 2·5 cm. longum; sepala lateralia subobliqua, late elliptica, apice acuminata et recurva, circa 2·5 cm. longa. *Petala* anguste elliptico-oblonga, apice apiculata et recurva, nitida, trinervia, 1 cm. longa. *Labellum* trilobum, 5 mm. longum; lobis lateralibus angustis obtusis erectis; lobo intermedio late oblongo obtuso reflexo; callo oblongo obtuso carnoso. *Columna* oblonga, 4 mm. longa.

HABITAT NOT KNOWN.

A species introduced by Messrs. Sander & Sons, and afterwards by Messrs. Hugh Low & Co., who sent a plant to Kew, where it flowered in June, 1906. The sepals are greenish-yellow, faintly lined with brown, the petals whitish, with three brown lines and a brown blotch at the apex; and the lip greenish-yellow, with brown radiating veins on the side lobes.

286. **Renanthera annamensis,** *Rolfe;* a *R. Imschootiana*, Rolfe, floribus duplo minoribus et sepalis maculatis distincta.

Herba epiphytica, erecta vel subscandens, radicans, 20–30 cm. alta. *Radices* crassi. *Folia* disticha, patentia, circa 2 cm. distantia, oblonga, obtusa et inaequaliter biloba, crasse coriacea, 5–7 cm. longa, 1·5-1·8 cm. lata. *Racemi* interdum ramosi, circa 20–25 cm. longi, multiflori. *Bracteae* ovato-oblongae, obtusae, 2 mm. longae. *Pedicelli* 1 cm. longi. *Sepalum* posticum anguste oblongum, obtusum, concavum, circa 1·3 cm. longum, 3·5 mm. latum; sepala lateralia spathulata, subobtusa, circa 1·8 cm. longa, 6 mm. lata. *Petala* anguste oblonga, obtusa, subconcava, 7 mm. longa, 2 mm. lata. *Labellum* trilobum, 6 mm. longum; lobi laterales erecti, triangulares, acuti, carnosi, 2 mm. longi; lobus intermedius patens, cordato-orbicularis, obtusus, 3·5 mm. latus, basi quinque-callosus; calcar saccatus, oblongus, obtusus, 4 mm. longus. *Columna* lata, 3 mm. longa.

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ANNAM. *Micholitz.*

Introduced by Messrs. Sander & Sons, and flowered at Kew in May, 1906. The ground colour of the flower is yellow, much spotted with crimson on the sepals, spur and base of the petals, while the lobes of the lip and apex of the petals are deep crimson. The column is yellow striped with crimson.

287. **Listrostachys Brownii**, *Rolfe;* inter species affines habitu compacto et racemis densifloris et congestis que distincta.

Caules breves, validi. *Folia* disticha, approximata, oblonga, inaequaliter et obtuse biloba, crasso-coriacea, 4–8 cm. longa, 1·2–1·5 cm. lata. *Racemi* arcuati, secundi, densiflori, 7–8 cm. longi, basi vaginis spathaceis obtecti. *Bracteae* late ovatae, acutae, cucullatae, 8–10 mm. latae. *Pedicelli* breves. "*Flores* albi, fragrantes." *Sepala* recurva, lineari-lanceolata, attenuata, acuta, 10–12 mm. longa. *Petala* sepalis similia. *Labellum* 8–9 mm. longum, basi triangulari-ovatum, cucullatum, apice attenuato-acuminatum et recurvum. *Columna* latissima.

UGANDA. Entebbe, at 1170 m. alt., *E. Brown*, 248.

A very distinct species, which Mr. Brown remarks grows in masses, and when in flower is a very showy plant.

288. **Platylepis australis**, *Rolfe;* affinis *P. glandulosae*, Reichb. f., a qua differt sepalis lateralibus latioribus medio subito reflexis, labello basi bigibboso medio constricto.

Rhizoma repens. *Caulis* ascendens, foliosus. *Folia* petiolata, ovata, subacuminata, membranacea, 15–21-nervia, 5–10 cm. longa, 2·5–5 cm. lata; petiolus 3–5 cm. longus, basi in vaginam membranaceam tubulosam dilatatus. *Scapi* erecti, 15–30 cm. longi, vaginis spathaceis distantibus obtecti; racemi oblongi vel elongati, 5–12 cm. longi, multiflori. *Bracteae* ovatae, acutae, glanduloso-pubescentes, 6–12 mm. longae. *Pedicelli* 6 mm. longi, pauce glanduloso-pubescentes. *Sepalum* posticum erectum, oblongum, subobtusum, 6 mm. longum, extus glanduloso-pubescens; lateralia basi subconniventia, medio subito reflexa, oblonga, subobtusa. *Petala* spathulato-linearia, obtusa, cum sepalo postico in galeam angustam cohaerentia. *Labellum* 6 mm. longum, erectum, basi ventricosum, bigibbum, columnae marginibus laeviter adhaerens; limbus elliptico-oblongus, basi constrictus, apice recurvus. *Columna* 5 mm. longa, clavata. *Platylepis glandulosa*, Bolus in Journ. Linn. Soc. xxv. 187, et Ic. Orch. Austr.-Afr. i. t. 11, non Reichb. f.

S. AFRICA. Natal; in swampy places on the shores of the Bay of Natal, *Wood*, 412; *Sanderson*, 1048; *Saunders; MacOwan & Bolus*, Herb. Norm. Aust.-Afr., 1008.

Hitherto considered identical with the West Tropical African *Platylepis glandulosa*, Reichb. f. It has recently flowered at Kew; the flowers are green with a white upper half to the lip.

289. **Platylepis densiflora**, *Rolfe*; a praecedente sepalis angustioribus, lateralibus medio nec reflexis, petalis angustioribus, et labello medio nec didymo nec constricto differt.

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Rhizoma repens. *Caulis* ascendens, foliosus. *Folia* petiolata ovato-oblonga, breviter acuminata, membranacea, 9–17-nervia, 5–11 cm. longa, 2–4 cm. lata; petiolus 3–4 cm. longus, basi in vaginam membranaceam tubulosam dilatatus. *Scapi* erecti, 10 cm. alti, vaginis lanceolatis acuminatis imbricatis obtecti; racemus ovoideus vel oblongus, 2·5–5 cm. longus, densiflorus. *Bracteae* ovatae vel lanceolato-ovatae, acuminatae, glanduloso-pubescentes, 12–18 mm. longae. *Pedicelli* 8 mm. longi, glanduloso-pubescentes. *Sepala* subaequalia, lineari-oblonga, subobtusa, basi conniventia, dein laeviter recurva, 3 mm. longa, extus glanduloso-pubescentia. *Petala* linearia, acuta, cum sepalo postico in galeam angustam subcohaerentia. *Labellum* 6 mm. longum, erectum, basi paullo ventricosum, columnae marginibus laeviter adhaerens; limbus oblongus, apice angustus, valide recurvus; discus bicarinatus. *Columna* clavata, 5 mm. longa.

MADAGASCAR. *Warpur; Baron*, 6550, 6753; Mauritius, summit of the Pouce, in dense woods, *Ayres*.

Flowered at Kew in December, 1901, the plant having been collected by Mr. Warpur. The flowers are light green with a whitish lip. The Mauritian specimen, which is in fruit only, was referred to *Platylepis goodyeroides*, A. Rich., by Spencer Moore (Baker Fl. Maurit. p. 339), but, as Bentham has noted on the sheet, it differs in the shape of the bracts and venation of the leaves. It seems identical with the Madagascar plant.

290. **Cypripedium Wilsoni**, *Rolfe;* affine *C. fasciolato*, Franch., sed flore majore et labello ovoideo nec globoso differt.

Caules 30–40 cm. alti, puberuli, foliosi. *Folia* subsessilia, late elliptica vel orbiculari-elliptica, acuta vel breviter acuminata, plicata, minutissime puberula et ciliolata, 9–16 cm. longa, 4–12 cm. lata. *Flores* maximi, terminales, solitarii. *Sepalum* posticum ovatum, acuminatum, 6 cm. longum; lateralia paullo angustiora, apice breviter fissa. *Petala* anguste oblonga, acuminata, 6–7·5 cm. longa. *Labellum* maximum, late ovoideum, obtusum, 6·5–7 cm. longum, ore crenulato. *Columna* 1 cm. longa; staminodium cordato-ellipticum, concavum, 2 cm. longum. *Capsula* ellipsoidea, glanduloso-pubescens, 3–5 cm. longa.

WESTERN CHINA. Szechuen; Mêng Hu Kăng, a pass between Wantung and Mosimien, on the main road from Tzutati to Tatienlu, in woods, under dense shade, at 2400 m. alt., *E. H. Wilson*, 4581.

The largest-flowered species known. Mr. Wilson describes the sepals and petals as alternately striped with yellow and chocolate, and the lip as pale yellow with chocolate spots.

LII.—SOUTH AMERICAN BEECHES.

The number of species of *Fagus* inhabiting South America is variously estimated, but there are at least four that stand out as quite distinct. They are *F. betuloides*, Mirb., *F. antarctica*, Forst., *F. obliqua*, Mirb., and *F. Dombeyi*, Mirb. Up to quite a recent date only two of them were cultivated in English gardens, viz., *F. betuloides* and *F. antarctica*, the two species which constitute so large a part of the sombre forests of Tierra del

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Fuego. Two others—a species and a variety—have, however, been recently added to this interesting group of trees; they are *Fagus obliqua* and *F. antarctica* var. *uliginosa*. Kew owes their acquisition to Mr. H. J. Elwes, who presented seeds in March, 1902, which he had collected during his travels in Chili and Argentine one or two months previously. Sown in gentle heat they germinated well, especially those of *F. obliqua*, and growing away freely they were planted out in the open ground, where they have now withstood two winters without any protection, and are at present in perfect health. It is, however, too early yet to proclaim them as hardy at Kew, for they have not been subjected to a temperature lower than 19° Fahr. Still, there is little doubt but that they will be perfectly at home in the southern and western counties of England and Ireland, and in the hope of ensuring them a permanent place in the gardens of the British Isles the few surplus specimens will this autumn be distributed to these and similarly mild localities.

F. betuloides is the best known of these South American Beeches in this country, and one of the finest specimens of it in cultivation is in the garden at Pencarrow, Cornwall. This tree is now 39 ft. high with a trunk 4 ft. 3 ins. in girth. The deep lustrous green of its small, prettily crenate, evergreen leaves, and its dense yet graceful habit render it one of the most striking and ornamental of hardy trees. It is now being tried in the open at Kew, but Woking is the nearest locality to London where it is known to have succeeded out-of-doors for any length of time. This is in Mr. Anthony Waterer's nursery. There is also a fine specimen in Mr. B. E. C. Chambers' garden near Haslemere. The species is very abundantly represented in Tierra del Fuego, some of the largest trees having trunks from 4 to 7 ft. in diameter.

F. Dombeyi.—This is an evergreen species bearing some resemblance to *F. betuloides* in foliage. Its leaves are ovate-lanceolate, of hard texture, serrate, and ½ to ¾ in. long. There is, however, a form represented in the Kew Herbarium with leaves 1½ ins. long. So far as we are aware, the species is not under cultivation in this country. Mr. Elwes kindly furnishes the following note upon it:—"This fine beech is known in Chile as 'Coigue,' and is very abundant in the forests of the western slope of the Andes up to about 5,000 or 6,000 ft. in the neighbourhood of the Baths of Chillan, and as far south as I went on the shores of Lake Nahuel-huapi. It attains a great size in favourable situations, one which I measured below the Baths of Chillan being 22 ft., and another 27 ft. in circumference at 5 ft. from the ground. It grows in pure forest or mixed with *Araucaria*, and, higher up, with *Fagus antarctica*. It crosses to the Argentine side of the frontier wherever the rainfall is sufficiently heavy, but does not extend to the drier region below about 3,000 ft. I brought home seeds and specimens collected at Lake Meliquina on February 9th. This tree is often covered with a very beautiful parasite called *Myzodendron linearifolium*, DC., of which good specimens are in the Herbarium. I was told by Mr. Barton, who was felling this tree for timber on Lake Nahuel-huapi, that the timber was too heavy to float when green." The seeds mentioned by Mr. Elwes do not appear to have been received at Kew or, if so, they did not germinate.

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F. antarctica is a deciduous-leaved species which grows intermingled with *F. betuloides* in the forests of Tierra del Fuego and extends far to the north into Chili. It is exceedingly rare in cultivation. Its foliage is variable in character, especially in the marginal cutting of the leaf-blade. In the var. *bicrenata* of De Candolle the leaves are mostly bicrenate, but in the var. *uliginosa*, now introduced by Mr. Elwes, they are multicrenate. Mr. Elwes has kindly supplied the following remarks about the latter :—"*Fagus antarctica* var. *uliginosa* is a smaller tree than *F. Dombeyi*, and is called 'Mere' in Chili. It occurs at higher elevations and forms a dense scrub on the Argentine side of the frontier, extending near the Baths of Chillan up to 7,000 ft., or more. On the mountains around Lake Nahuel-huapi it covers the summits up to 5,000–6,000 ft., and when I passed at the end of February the leaves had turned a brilliant red. It is affected by the same parasite that grows on *F. Dombeyi*, namely, *Myzodendron linearifolium*. The seeds which I brought home came from Lake Meliquina. At the Baths of Chillan I also found the bicrenate variety of this tree."

On the young trees at Kew raised from Mr. Elwes' seeds the leaves are ½ to 1¼ ins. long, cordate with an oblique base, irregularly and minutely crenate, and with the petioles so short that the basal lobes of the leaf often project beyond the stem. The slender unbranched shoots (this year 3 ft. long) clothed with these small, regularly alternate, closely set leaves, give to the trees a most distinct appearance.

F. obliqua.—Although this species is said to have been introduced previously, we are not aware of any trees growing in this country other than those raised in 1902 from Mr. Elwes' seeds.

The largest of the trees at Kew are now 9 ft. high and the growths of the past summer 2½ to 3 ft. long. Provided it proves hardy, it will evidently be a rapid-growing tree. Writing of this species Mr. Elwes says :—"This fine tree seemed to be confined to the lower levels in the territory south of the Bio-bio River, where it forms a large part of the forest and is cut for timber which is largely exported from Valdivia and Concepcion under the name of 'Roblé.' Some of this timber has been shipped to England by Herr von Voden, a merchant of Temuco, and has been tried for sleepers by the Great Western Railway Company, whose engineer at Swindon was good enough to send me a sample of it. It seems a hard, heavy wood of reddish-brown colour and compact grain, which would be suitable, when properly seasoned, for furniture.

"The forests are being rapidly destroyed by axe and fire and large crops of wheat being grown on the ground among the stumps.

"I collected seed of this tree at San Ignacio, where it is the host of a beautiful parasite, *Myzodendron punctatum*, Banks and Sol."

The leaves of *F. obliqua* are deciduous and, on the young trees at Kew, are oblong-ovate, doubly crenate, 2 to 3 ins. long, dark green above, paler and rather glaucous beneath.

W. J. B.

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LIII.—HUANG-CH'I.

(*Astragalus Henryi*, Oliv., and other species.)

(WITH PLATE.)

The Chinese drug *Huang-ch'i* is in considerable repute all over China. There are many kinds of this drug furnished by different species of *Astragalus*, and possibly of allied genera—plants of a herbaceous character with a thickened woody root-stock, which is the part valued. Chinese books acknowledge the existence of three or four kinds of the drug and one kind is figured in *Chih-wu-ming*, vii. 3.

The Huang-ch'i exported from the northern ports (Newchwang, Tientsin, Chefoo) is furnished in part, if not entirely, by *Astragalus Hoantchy*, Franch., and *A. mongholicus*, Bunge. The first-named was discovered in Mongolia by Père David and is described in Franchet's Pl. David. i., p. 86. It is a very distinct plant with 8–12 pairs of leaflets and a much introflexed suture in the legume. *A. mongholicus* is allied to *A. Henryi*, Oliv., but has smaller and more numerous leaflets, and larger legumes containing six or more seeds. In Central China (Hupeh, East Szechuan, and probably Shensi) the drug is furnished by *A. Henryi*, Oliv., a figure of which accompanies this note. In Western Szechuan it is the product of *A. moupinensis*, Franch. In other parts of China probably other species yield the drug.

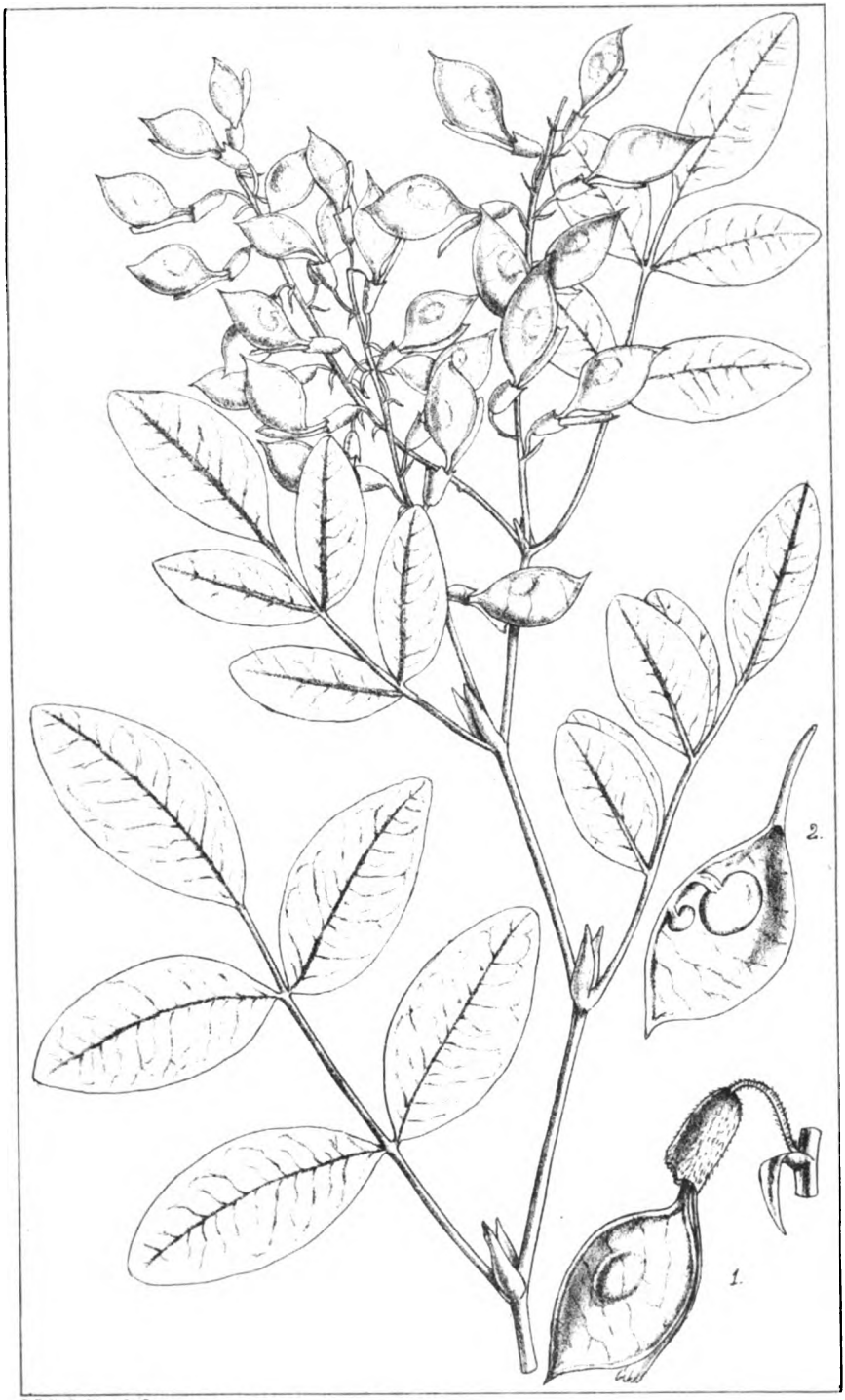
In Japan Huang-ch'i is furnished by *A. reflexistipulus*, Miq., and inferior kinds by *A. adsurgens*, Pall., and *Hedysarum esculentum*, Ledeb. Huang-ch'i is exported from the provinces of Manchuria, Chihli, Shantung, Szechuan and Hupeh to all parts of China chiefly through the ports of Newchwang, Tientsin, Chefoo, Ichang and Hankow. The total export from these ports averages about 400 tons annually, Tientsin and Hankow exporting two-thirds of the whole.

The different varieties of Huang-ch'i are distinguished by various names according to their place of origin or nature. Thus, Ch'uan-ch'i is the variety produced in Szechuan; Hsi-ch'i is the variety produced in Shensi; Hsi-fên-ch'i is a mealy variety produced in Shensi; Pei-ch'i, a variety from Manchuria and Chihli; T'iao-ch'i, the Manchurian kind exported from Newchwang; Hung-ch'i (Hung-p'i-Ch'uan-ch'i)—a reddish kind. The greater part of the Huang-ch'i passing through Ichang is on arrival at Hankow called by this name. The Huang-ch'i exported from Tientsin has an average value of Taels 12·50 per picul and is esteemed the most valuable kind of the drug.

The Hankow Huang-ch'i has an average value of Taels 5·60 per picul, and is considered inferior to that exported from any of the northern ports.

E. H. W.

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Astragalus Henryi, Oliv

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LIV.—MISCELLANEOUS NOTES.

CAPTAIN A. T. GAGE, M.A., B.Sc., I.M.S., who has been Curator of the Calcutta Herbarium since 1898, has been appointed Superintendent of the Royal Botanic Gardens, Calcutta, and Director of the Botanical Survey of India.

DR. D. H. SCOTT, whose appointment as Honorary Keeper of the Jodrell Laboratory was announced in the *Kew Bulletin* for 1892, p. 245, has relinquished the post which he has filled with such distinction during the past fourteen years, to the deep regret of all his colleagues, whose good wishes he carries with him on his retirement from Kew. The work done by Dr. Scott, and by those who have availed themselves of the hospitality of the Jodrell Laboratory during his Keepership, has been recorded from time to time in the *Bulletin*. Dr. Scott's eminent services while at Kew, and his distinguished contributions to palaeontological botany, have been recognised by the University of Aberdeen, which conferred on him the honorary degree of LL.D. in September, 1906, and by the Royal Society, which awarded him a Royal Medal in November, 1906.

MR. W. H. JOHNSON, F.L.S., has resigned the post of Director of Agriculture, Gold Coast, which he has held since 1904. Prior to this date he was Curator of the Botanic Station, Aburi, having been appointed in 1898, after a few months' service as Acting Curator (*K.B.*, 1898, pp. 54 and 334). Mr. Johnson has done excellent work in the Gold Coast Colony. To his efforts the establishment of the Cacao industry is largely due; he has also done much to further the establishment of rubber cultivation there. He has now joined the service of the Companhia de Mosambique, and has proceeded to Beira, Portuguese East Africa.

MR. J. STOCKS, formerly Private Secretary to the Director, has also accepted an appointment in East Africa.

Mr. STANLEY ARDEN whose appointment as Superintendent of Experimental Plantations in the Federated Malay States was recorded in the *Kew Bulletin* for 1900, p. 15, has resigned that post, and has entered private employ as a rubber planter. It is now officially notified that Mr. J. W. CAMPBELL, Superintendent of Government Plantations, Larut (*Kew Bulletin*, 1904, 13), has been appointed to succeed Mr. Arden, and that Mr. T. W. MAIN, whose appointment was noted in *Kew Bulletin*, 1906, p. 88, has been selected to succeed Mr. Campbell.

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G. C. CHURCHILL.—The death, in his eighty-fifth year, of Mr. G. C. Churchill, which occurred at Clifton on 11 October, 1906, has deprived Kew of an old and tried friend.*

George Cheetham Churchill was born at Nottingham, where his father was a manufacturer, on 25 September, 1822. The branch of the Churchill family to which he belonged had not been long resident in Nottingham; it migrated there from Northampton where an ancestor had settled in the seventeenth century on his marriage with a daughter of Sir William Fleetwood of Aldwinkle near that town. Sir William's younger brother Charles, a Parliamentary General, married the eldest daughter of Oliver Cromwell. Churchill's mother was a daughter of George Cheetham of Stalybridge, whose nephew of the same name now represents that borough.

Churchill's father was drowned in the wreck of the Forfarshire off the Farne Islands in 1838, leaving his son, at the age of 16, to make his way in the world. Shortly after his father's death, Churchill, who had been educated at private schools in Nottingham, was articled to a local firm of solicitors, one of whose partners then acted as Town Clerk of Nottingham. At the close of his articled term, Churchill continued his legal training in the office of a solicitor in London.

Even as a boy Churchill appears to have been inclined to scientific pursuits. As a youth he was keenly interested in entomology, made a considerable collection of butterflies, moths, and beetles, and was able to extend the known range of more than one species. Shortly after the completion of his legal training he devoted some time to the study of land treatment, a subject to which he was attracted by his interest in the agricultural experiments carried on by Mr. (afterwards Sir) J. Lawes, and Dr. (afterwards Sir) J. H. Gilbert; an artist brother of the latter, Mr. Josiah Gilbert, became one of his most intimate friends. From this period of study may be dated the interest that Churchill took in geology.

In 1853 Churchill married Anna Maitland, daughter of the Rev. G. Laurie, of Camberwell, a lady of artistic and musical talent, in full sympathy with her husband's scientific pursuits. After his marriage he resumed legal work and settled in Manchester, where for the next ten years he was a successful solicitor. But though an excellent lawyer, he did not really care for the work, and it was a relief to him when in 1863 his increased income enabled him to abandon practice and give all his attention to science.

During the period of his active professional life in Manchester, his annual holidays were arranged with regard to the tastes of his wife and himself. He had been already attracted to some extent towards botany; he became more and more so as time went on and commenced the formation of a private herbarium, specimens

* Facts relating to the career and work of the deceased, and impressions of his personality have been kindly supplied by his brother Mr. W. S. Churchill, by his niece Mrs. Fennell, by Sir W. T. Thiselton-Dyer, Canon Ellacombe, the Rev. Professor Bonney, Mr. G. H. Wollaston, Mr. F. F. Tuckett, and Professor Lloyd Morgan, to all of whom the writer wishes to express his warm thanks. Mr. Churchill's correspondence with Kew, which began in 1885 and continued till 1899, has also been made use of in preparing this sketch.

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for which were accumulated during these annual tours. The earlier journeys were made in Scotland and Ireland, but these soon gave place to Alpine tours, at first in Switzerland, later on in Southern Austria. From 1861 onwards Churchill and his wife were accompanied by their artist friend Josiah Gilbert and Mrs. Gilbert.

As a result of these Austrian journeys Gilbert and Churchill collaborated, after the retirement of the latter from legal practice, in the preparation of a work entitled "The Dolomite Mountains: Excursions through Tyrol, Carinthia, Carniola, and Friuli in 1861, 1862, and 1863," Churchill being responsible for the scientific, Gilbert for the artistic portion of the book. But the talented Mrs. Churchill also took a considerable, if indirect, share in the work. She had written to friends at home, during the various journeys, a series of charming descriptive letters; these letters were referred to while the work was in progress, and were often of use in giving a graphic touch to the narrative. The third chapter in the work, which deals with a preliminary excursion made unaccompanied, in 1860, in the country to the east of Bosen, is by Churchill alone. The eighteenth chapter, which concludes the book and is devoted to a physical description of the Dolomite region, is also his. Botany, geology, and mountain scenery, however, by no means exhausted the interests of the party, for Churchill, though not himself master of any instrument, took much delight in good music and had a considerable knowledge of the subject. He was particularly interested in the popular and especially in the sacred music of Carinthia and other Slovak countries, and, assisted by his wife, made a considerable collection of Slovak melodies.

The work on the Dolomite Mountains, which was issued by Longman in 1864, at once took a prominent place in the literature of Alpine travel. It practically introduced to English travellers and climbers the previously little-known South Austrian Alps. After the work appeared Churchill was elected a member of the Alpine Club, and in the same year, 1864, he became a Fellow of the Geological Society. Two years later Mrs. Churchill died, and we find that Churchill devoted himself, again in company with his friend Gilbert, to writing a "Knapsack Guide to Tirol," which was issued by Murray in 1867.

In 1868 Churchill married, as his second wife, Rosaline, daughter of F. Millett, Esq., of the Bengal Civil Service. On account of his wife's indifferent health Churchill settled at Mentone, but a year later, for the same reason, he moved to Clifton, which continued to be his home from 1869 till his death. The change, however, did not effect its object; the second Mrs. Churchill who, though in full sympathy with her husband's scientific inclinations, was, owing to ill-health, unable to take part in his Alpine journeys, died in 1870.

In 1873 Churchill married, as his third wife, Frances, daughter of the Rev. E. Peacopp, of Boston Spa, Yorkshire, who survives him. Mrs. Churchill was the companion of all his Alpine journeys from 1873 onwards so long as he was able to go abroad at all, and gave him much assistance in the conduct of the extensive correspondence which he kept up with Continental botanists and plant

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collectors. His herbarium shows that at least as early as 1869, in addition to the specimens obtained by himself, he had begun to add to his collection material derived from sets of plants issued by leading European collectors, and that from this time onwards he added in the same way to the number of alpines in his garden at Clifton. Some years later he began the practice of paying annual visits to Kew; visits which evidently afforded him the keenest pleasure and ultimately led to his taking a very practical interest in the establishment, for it was largely through his help that Sir William Thiselton-Dyer was able to build up the fine collection of alpines at Kew. In touch as he already was with Continental collectors, he gave assistance, from 1885 onwards, in negotiating for the actual supply of many of the plants themselves. A competent German scholar, some of these letters he wrote himself; those to French and Italian correspondents were, however, translated by Mrs. Churchill. His assistance to Kew did not end here; he had completely mastered the nomenclature of the European alpines, and his help was invaluable in checking this. His first actual gift to Kew consisted of some alpine specimens collected by himself and presented to the herbarium in 1884.

In 1892, in connection with a will he thought of making, he announced the intention he had formed of bequeathing to Kew his European herbarium. This consists of a general collection arranged in natural families and of numerous special collections made by individual botanists from which, up to this time, he had taken the particular specimens required to strengthen his general collection. "From my knowledge of the Kew Herbarium," he wrote, "the additions Kew would get would be:—good *Primulae* and other European hybrids; good specimens of species Kew already has, but more perfect than those of Kew; and specimens from other localities than those of Kew. Of course the great mass would be duplicates." This brief note accurately characterises the collection, which consists entirely of named specimens. As time went on he found it difficult to deal with the mass of material which kept steadily pouring in, and proposed to hand over the duplicates he did not require to Kew. In a letter dated 22nd October, 1895, he says:—"I wish to make a proposal. I have no room for any more dried plants or plant parcels, and yet there are three or four lists which I receive annually that are very likely to contain desiderata I should much wish to study. Now would you be willing to accept such desiderata for the herbarium, free, of course, of all cost to Kew, on condition I sent you a list of such which I intended to order? I would first examine them and then send them, carefully packed, to you." The arrangement thus suggested continued during 1896, when he presented to the herbarium:—Spanish plants collected by E. Reverchon, 53; plants from Baenitz' Herbarium Europaeum, 145; Transsylvanian plants from Sagorski, 82; specimens from the Wiener Tauschverein, 207; and again during 1897 when his gifts were:—from Baenitz' Herbarium Europaeum, 83 specimens; Spanish plants collected by Porta and Rigo, 220; rare and critical European specimens, 176; and specimens from Bulgaria, Servia, and Croatia, 66.

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Failing health prevented his sending further specimens to Kew, and it would appear as if he had now become unable to overtake the task of incorporating desiderata in his general collection, for in a note written on 16th January, 1899, he speaks of "parcels of plants in an attic which contain many duplicates but some that are not in my cabinets; and I should like to send them over to the Kew Herbarium, and not give my executors the trouble of despatching them." Six months later he explained that he had been unable to undertake the despatch of these parcels mainly owing to the after effects of an accident, a fall in crossing a room, which had happened in 1892.

The parcels in question were never sent by Churchill, and the note referred to is the last item in the long and interesting series of letters written by him to Kew. They now, however, have reached the destination he had intended for them, having been received with rest of the collection bequeathed under his will to the Kew Herbarium.

The collection includes 50 cabinets filled with parcels of plants. Of these cabinets 28 are devoted to the general European collection mentioned above, the remainder contain portions of special collections from which specimens required to strengthen the general collection appear in most cases to have been already removed. There are, however, in addition, as many parcels of plants, for which there is no accommodation in the cabinets, as the cabinets actually hold. These parcels contain, in every case, portions of special collections; from some of them, as his correspondence shows, the specimens required to strengthen the general collection have not yet been abstracted. The whole herbarium includes about 10,000 species, varieties and hybrids.

An intimate friend of long standing writes:—"Mr. Churchill was a delightful companion and a very interesting talker on all subjects, whether one met him in a drawing-room or—as was more commonly the case—on the Downs. He was completely human and all human knowledge interested him."

The journeys described in "The Dolomite Mountains" were undertaken for mountain-travel rather than for Alpine climbing and, as we have seen, the authors during the tours of 1861, 1862 and 1863 were accompanied by their wives. Even as regards the Bosen journey of 1860, which he made alone, Churchill remarks that "the reader will probably have inferred that I shirk ice-work, and am not a member of the Alpine Club: my willingness to ascend ceases with the last phanerogamic specimen." Although he did, soon after this was written, become a member of the Alpine Club, he appears never to have contributed to its Journal, and certainly never receded from the attitude here adopted. For, in a letter written in November, 1891, he writes:—"Dr. Savage seems to be another member of the Alpine Club that has not bowed the knee to the Baal of mere climbing. I used to imagine that Ball, W. Mathews, Packe and myself were the only ones; but now I have been told of Dr. Savage, and lately of Sowerby." But if Churchill never professed to take an active part in, or indeed to personally care for mountain-adventure he had nevertheless more sympathy than these passages would imply with the special aims of 'climbers,' among whom he reckoned some of his most intimate friends.

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The only contribution to geological literature which we owe to Churchill is the chapter from his pen on the physical structure of the Dolomite Mountains. Though this shows no sign of independent work it indicates that the writer had studied the more important books and papers relating to the physical geography and geology of the region, and proves that he was no mere summarist, but one who was competent to discuss and criticise the hypotheses that had been advanced with regard to the origin of dolomite. "In the two aspects of alpinist and geologist," remarks one who is himself equally and eminently both, "my general impression is that Churchill was a true lover of the Alps without being a climber in the technical sense, and had a good general acquaintance with geology without being a specialist. I imagine, but here I am venturing off my own ground, that in his knowledge of the Alpine flora he was second only to Ball."

This estimate of Churchill's acquaintance with the vegetation of the Alps is probably just; his knowledge of alpines was extensive and minute, nor was Kew alone indebted to him for the accurate determination of critical species. Another friend of many years standing, to whose garden Churchill paid annual visits, writes:—"As we went round the garden he was ready to examine every plant and to tell me if it was rightly or wrongly named. If he was uncertain he would take some of the plant home and in a few days came a full account of it, with the authorities. He was most painstaking and with his kind courtesy it seemed as if nothing gave him so much pleasure as to hunt out for a friend all the information in his power. I always felt that when I got his decision on a plant I had touched rock."

Plants other than European had little attraction for him, unless they were from the Himalayas or from Alpine China and were related to European species. Little of his great and critical knowledge of the Alpine flora ever was made generally available, though he took the keenest interest in the work of others and sometimes, as in the case of the issue of Ball's tables of the distribution of plants on the south side of the Alps, for the posthumous publication of which botanists are indebted to the piety of the late Director of Kew, he supplemented this interest with direct and active encouragement.

Another instance of his interest in matters alpine was afforded by the appearance of Huxley's paper 'The Gentians; Notes and Queries,' in the Journal of the Linnean Society, vol. xxiv., p. 101 (1887). The point in this paper on which Churchill particularly desired further light he describes (June 20, 1888) as "the—to me—astounding statement of Huxley's, at the end of his paper, read at the Linnean Society, that the more he examined the Gentians there, more and more varying forms present themselves, making it almost impossible to allocate these to the regular species of the floras. But he says not a word in all his paper of hybrids! My experience is so different to this that I hesitate to accept the statement." In a subsequent letter (June 26, 1888) he writes:—"I am very glad to hear you intend to take Huxley's paper . . . I have only to ask you to bear in mind the possibility of hybrids as well as of intermediate non-hybrid forms. Also if you would dry a few specimens of any plants that look like *G. germanica*, W.

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For Kerner, as you know, has separated three species from what had been subsumed under the name of *G. germanica*, and named them *G. austriaca*, Kern., *G. Sturmiana*, Kern., and *G. rhaetica*, Kern. . . . Now *G. rhaetica* seems dominant in Tirol and I do not yet know if all my Tirol specimens are not that form and that *G. germanica* is not there at all. Then the question comes—is the form in Switzerland *G. rhaetica* or *G. germanica* or do both occur there? . . . Gremli in his 'Excursionsflora für die Schweiz,' 5th edit., 1885, which is three years later than the publication of the above, does not notice the matter and even in his 'Beiträge,' published only in 1887, omits to do so, though calling attention to the form *Sturmiana* as occurring near Bregenz."

Again, on November 9, 1888:—"I regret from my selfish point of view that you did not go abroad, as I was curious to learn how the Gentian forms struck you unguided by the blinkers of published floras What you tell me about Huxley is news Where were the two isolated areas in the Engadine and which were the two species of Gentian and which the hybrid? When I was on the Albula and on the Julian Passes I found a good many hybrids such as those between *Gentiana verna*, *G. brachyphylla*, and *G. bavarica*, also *G. supra-lutea* × *punctata*; to say nothing of other orders."

A week later, November 17, 1888, he says Huxley's "account of the circumstances under which he met with the hybrid form *Gentiana punctata* × *lutea* is very interesting, and I hope next summer he will be able to observe other forms which he will conclude to be of hybrid origin. I wish he would go up to the summit of the Albula from Samaden some fine day about the middle of July, and I am much mistaken if he will not come across hybrids between *G. verna*, *G. bavarica* and *G. brachyphylla*. On the Alp about halfway between Bergün and the top of the pass I gathered one *Gentiana* supra-*lutea* × *punctata*; several *Pedicularis recutita* × *incarnata*; and *Cardamine alpina* × *resedifolia*. In Val Bever just over the Albula ridge *Gentiana punctata* × *lutea* is frequent, and specimens of these I have received from old Krättli. Huter also has got the same hybrid on Monte Roën in South Tirol, of course *inter parentes*."

Two years later, January 19, 1891, he wrote:—"as to Gentians. You say you don't believe in the species running into one another, as the result of your observations. This is precisely my experience, and I have not come upon a single instance pointing the other way. With this conviction I was struck with the note affixed to specimens of *Gentiana Gaudiniana*, Thom. (*punctata* × *purpurea*), in the Kew Herbarium, gathered by Christener of Bern on July 30, 1869. Christener says 'In allen Uebergangsformen, gar nicht selten zwischen unzahligen ex. der Eltern neben dem Martinets Gletscher auf der Alp nant oberhalb Bex.' And in Focke's 'Die Pflanzen-mischlinge,' Berlin, 1881, though nothing is said under the head of *G. purpurea* × *punctata*, yet at p. 256 under *G. lutea* × *punctata*, he says 'Kommt in allen Uebergangsformen vor,' and that all these were found in 1819 by Guillemin and Dumas on the Môle in Savoy. I can't refuse to believe this, but I should very much like to see the specimens. I don't think

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either Kew or British Museum has any. When I was on the Albula in 1877 I came upon the hybrids between *G. lutea* and *G. punctata*, and I could only find two forms ; the one nearer to one parent and the second nearer to the other. On the Albula too I looked for hybrids between *G. verna*, *bavarica* and *brachyphylla*, and found them numerous and gathered many specimens, and I don't think I ever found more than one form of hybrid between each species. I used to lie down on the grass among them, and could always detect the hybrids by the different tint of blue they showed. Everywhere that I have botanised I have always been on the lookout, and I have never seen any case of 'Uebergangsformen.' I may say the same of *Pedicularis*, *Primula*, *Achillea*, *Campanula*, *Saxifraga*. One usually finds either a hybrid exactly between the parents ; or two, one nearer one parent, the other nearer to the other ; or three ; or finally four, as in *Primula minima* × *P. glutinosa*, where you have *P. Floerkeana* (super-*glutinosa* × *minima*), *P. salisburgensis* (sub-*glutinosa* × *minima*), *P. Huteri* (*Floerkeana* × *glutinosa*), and last *P. biflora* (*salisburgensis* × *minima*). Among *Cirsia*, however, Dr. Focke records *C. rivulare* × *palustre*, *rivulare* × *acaule*, and *oleraceum* × *acaule* as producing several 'Uebergangsformen.' But compared with the numerous cases of hybrid *Cirsia*, the number of those showing 'Ueberganformen' is, I think, very small. It seems to me that Huxley rushed too quickly to his conclusions." In a later letter, January 31, 1891, Churchill wrote :—"as regards the statement that horticultural experience does not confirm my view as to the limited number of hybrid forms in each case, I would reply that horticulture upsets the old state of balance of the conditions, and that therefore different results would arise. In nature the equilibrium does not quickly change, and therefore the new results are fewer. If you refer to all the best floras of Europe I think you will find that 'Uebergangsformen' are exceedingly few. So far as I have examined it is so." Once more, February 10, 1891 :—"If 'Uebergangsformen' were numerous among alpines Ball must frequently have come across such. Prof. Bruegger of Chur is about the greatest hybridomaniac—so Deseglise the greatest hybridophobist styled him—I know ; and yet in his 'Beobachtungen' on hybrids of the Swiss and neighbouring floras, professing to describe some three or four hundred forms, and which I have looked over at different times, I think I have not come across a single case. It is true that Gremli and Buser have pitched into him apropos of *Salices* and some others ; but that hardly touches the bulk of his descriptions. If he had ever come across cases of a series, of say five, six or more forms filling up by regular stages the interval between two recognised species, we might trust him to mention it. I have not seen mention of such in Kerner's writings, nor in Gremli, or Hausmann, or Hegetschweiler, or Schlosser. Huter's and Porta's experiences have been continuous in Tirol from 1860 to the present day, and I have never heard of such from them. My present conclusion is that the recognised species have long been in a condition of perfect equilibrium with their environment, only disturbed by insect action to a limited extent; but when you begin to cultivate them new forces are set in action and produce no end of changes." His last word on the subject, March 11, 1891,

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is :—"'Uebergangsformen.' My experience, so far as it has gone, does *not* agree . . . as to 'the abundant occurrence in nature' of these. This term would apply of course both to natural hybrids and to seedling varieties. I have taken note more of the former of these. But the writers of the floras of different parts of the Alps agree with me rather, if their silence means anything. They never refer to the existence of numerous hybrid forms between two species, with the few exceptions I gave in a former letter. There is a complete 'conspiracy of silence' amongst them. When Kerner wrote on 'Primel-Bastarte' in 1875, would he not have carefully noted the existence of 'any number of intermediates' if he or his botanical friends had ever come across them? In idea three primary Bastarte and six secondary are possible, and yet Kerner says that these secondary Bastarte, as also the triple Bastarte, are 'extremely rare'; and among *Primulae* he only knows of *P. biflora* and *P. Huteri*, thus ignoring altogether the existence of 'any number of intermediates' between cowslip and primrose. Between these two last he describes but two: *P. brevistyla*, DC. (sub-*acaulis* × *officinalis*) and *P. flagellicaulis*, Kerner (super-*acaulis* × *officinalis*). Under the former head he refers to the difference in size=one-third of all the parts between Austrian and French specimens, but no hint is added of there being more than these two hybrids known. He quotes Boreau as testifying to the existence of these *two* hybrids in the centre of France. Now if Boreau had observed more than these two, would he not have described them? In Focke's 'Mischlinge,' p. 246, however, he quotes Loret as saying that at Pau he found '*four* Uebergangsformen' between *acaulis* and *elatior*! He adds, a little further on, 'evident transitions *back to the parents* (primrose and cowslip) do not appear to have been observed in a wild state; I have often sought for such near the lake of Geneva, but in vain.' . . . I know about *Geum rivale* and *montanum*, but I should like to know *how many* intermediates. I do not believe in any number. I have referred to Grenier and Godron's 'Flore de France,' and to Naegeli, but I am still inclined to maintain that in a *wild* state 'any number of intermediates' is a very rare phenomenon. Can Baker give me the three primary and six secondary intermediates between cowslip and primrose? Are they all in the Herbarium? When I have seen these I shall be more credulous of the existence of a possible tenth intermediate. There is plenty more to say; but my eyes and wrist are tired."

These extracts from Churchill's letters may serve to show how interesting as a correspondent he could be, and to indicate both the manner in which he faced any problem connected with the Alps, and the information he was able to bring to bear on its discussion.

The portraits of Churchill show that in middle life he was an exceedingly handsome man, in some respects bearing a strong resemblance to Tennyson. He was a man of unvarying kindness and gentleness, always ready to assist, from the stores of his knowledge or from his herbarium, those who applied to him for information regarding the flora of Europe. His liking for music has already been alluded to. He had not mastered any instrument, but during the year of his residence at Mentone he was fond of

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singing in chorus with friends, and, after settling at Clifton, he took a great interest in the Bristol Musical Festivals. In oratorio music and orchestral concerts he found a particular pleasure.

A marked idiosyncracy was his constitutional dislike for tobacco, one effect of which was that he was never able to join the Bristol and Clifton Scientific Club which meets monthly to dine, and, after dinner, to read or to hear papers read, and to discuss them "in a cloud of smoke."

F. W. BURBIDGE.—Full and appreciative accounts of the life and work of this old Kewite appeared in several of the gardening papers shortly after his sudden death, which took place on Christmas Eve, 1905; but the fidelity and generosity of the deceased to Kew deserve recognition here.

Burbidge was born at Wymeswold, Leicestershire, on March 21, 1847; his father being a farmer and fruit grower. After spending some time in the gardens of the Royal Horticultural Society, at Chiswick, where he obtained many distinctions, he entered Kew, where he was equally successful. Enthusiastic in all branches of horticulture, and none the less a student of botany, he early developed considerable skill in wielding both pen and pencil, and part of his time at Kew was devoted to drawing plants for the general collection. After leaving Kew in 1870 he spent several years on the staff of "The Garden," and in writing works on various horticultural and botanical subjects; all of which were well received. Among these was his illustrated History, &c. of *Narcissus*, to which Mr. J. G. Baker contributed a descriptive classification of all the species. In 1877–8 he was engaged on an exploring mission to North Borneo on behalf Messrs. James Veitch & Sons, the object being the introduction of new and beautiful plants, in which he was highly successful. Specially interesting among his introductions of living plants were various species of *Nepenthes*, including the giant *N. Rajah*, figured in the "Botanical Magazine" last year (t. 8017), from one of Burbidge's original plants. The narrative of his travels and acquisitions is in his book entitled, "The Gardens of the Sun," 1880. Burbidge not only collected seeds and living plants, but he also dried a large number, and through the liberality of Messrs. Veitch, Kew received the first set amounting, with some given by Burbidge himself, to nearly a thousand species. Many species bear his name, and Sir Joseph Hooker named *Burbidgea nitida* (Botanical Magazine, 1879, t. 6403) "in recognition of Mr. Burbidge's eminent services to Horticulture, whether as a collector in Borneo, or as author of 'Cultivated Plants, their Propagation and Improvement,' a work which should be in every gardener's library." In 1879 Burbidge was appointed Curator of the Botanic Garden of Trinity College, Dublin, a post which he held till his death. He received a number of horticultural distinctions, including the Victoria Medal of Honour and the Veitch Memorial Medal, and in 1889 the Dublin University conferred on him, *honoris causa*, the degree of Master of Arts. He was also a member of the Royal Irish Academy. Throughout his career Burbidge was always faithful to Kew, and

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being very fond of the early works in botany and gardening he often did her a service by presenting a book, or putting her in the way of procuring it. Among his gifts was a fine copy of the rare "Prodromi Fasciculi Rariorum Plantarum, &c.," of J. Breyn, 1739, containing the book-plate of a former owner, Robert James, Lord Petre, who had a notable garden at Thorndon in Essex, under the supervision of the celebrated Philip Miller. He also presented a considerable collection of wrappers of early numbers of the "Botanical Magazine," which bear many announcements and advertisements of great historical interest. Burbidge not only collected old books, but he read them, and was full of information, which he imparted to others in such a pleasant modest way that one was never tired of listening; and he had none but friends, because he rarely uttered a disparaging word of another.

W. B. H.

O. T. HEMSLEY.—In the Annual Report on the Government Agri-Horticultural Gardens, Lahore, for the financial year 1905-6, the President, addressing the Government of the Panjab, wrote:—"The gardens have sustained a great loss in the sad and untimely death of Mr. Hemsley, the late Superintendent, who succumbed on January 6th, after a short illness, to a malignant attack of small-pox. His energy and devotion to his duties have been acknowledged in previous reports. His work in 1905 was again deserving of all praise."

In reviewing this report the Chief Secretary to the Government of the Panjab wrote:—"The Lieutenant-Governor takes the opportunity of recording his regret at the death of Mr. Hemsley, to whose labours the improvement of the gardens has been so largely due."

Oliver Tietjens Hemsley, the only son of Mr. W. B. Hemsley, F.R.S., Keeper of the Herbarium at Kew, was born at Richmond, Surrey, on February 6, 1876, so that at the time of his death he had not yet entered his thirtieth year. He was educated at Dr. White's School, Turnham Green, and at King's College School, London. In 1893, when 17 years of age, he entered the Royal Gardens. In the Garden Lectures he took a distinguished place.

In 1898 young Hemsley went to India, and on his arrival was posted to the Cinchona Department in British Sikkim where, with the exception of a short period during which he acted as Curator of the Lloyd Botanic Garden, Darjeeling, he served as an Assistant till 1903. His duties in the Cinchona Department lay both in the factory and on the plantation. His inclinations, however, were more towards horticulture than planting, and in 1902 he expressed a desire to be transferred to a post in the plains, there to make himself more familiar with Indian gardening conditions than was possible in the comparatively temperate altitudes at which cinchona is grown, and so to qualify for subsequent promotion.

A vacancy occurring in the Royal Botanic Gardens, Calcutta, he was appointed Assistant Curator there in 1903. He had hardly taken up his duties in this capacity when an opportunity was given him of facing a difficult task. An Imperial Durbar was to be held that winter at Delhi, and the sites of the various sections

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of the great Durbar camp had to be treated in such a fashion as to prevent their appearing, as otherwise in the cold weather they must, to be part of a dusty arid plain. The executive gardening duties connected with the Bengal section of the camp were entrusted to Hemsley. These he took up with enthusiasm, and—in spite of a breakdown in health—performed so well as to earn the commendation of Major Strachey, the officer in charge of the Bengal Camp, and of the late Mr. Gollan, Superintendent of the Saharanpur Botanic Garden, who was in administrative charge of the gardening operations generally.

As events transpired, young Hemsley did not return to Bengal. The impending retirement of Mr. H. G. Hein, the respected Superintendent of the Agri-Horticultural Gardens at Lahore, was announced, and Hemsley was chosen as Hein's colleague and successor. The quality of Hemsley's work at Delhi under circumstances of unusual difficulty augured well for his success at Lahore; nor was the anticipation belied. His work was spoken of in high terms in successive annual reports, the last melancholy reference being that with which this note opens.

Hemsley's was a bright and kindly disposition. Good tempered and warm-hearted, he made many friends. He was a keen volunteer; while an Assistant on the Cinchona Plantation he was an enthusiastic member of the Northern Bengal Mounted Volunteers; at Lahore he was an equally enthusiastic member of the Panjab Light Horse. This corps paid a worthy tribute to a devoted volunteer at his funeral, which was a military one, all the officers of the corps being present, as were officers representing the Staff of the Lieutenant-Governor and the 1st Panjab Volunteer Rifles. His own corps supplied the firing party, while crosses and wreaths were sent by the Lieutenant-Governor and Lady Rivaz, by the officers of his corps, and by the native staff of the Lahore Garden. His friends have since decided to erect a monument over his grave.

Hemsley married some time after taking up his appointment at Lahore and has left a widow and an infant daughter.

JOHN MAHON.—It is unhappily not rarely the case that the Bulletin has to record the death of a Kew man who, while his career has scarcely left the initial stages, has fallen a victim to the climate of one or other of our colonies whither he had gone, full of energy and enthusiasm, to carry on the work of some remote botanic station.

After a long illness J. Mahon, or J. M. Browne as he was known up to the time of his leaving Kew in 1897, died in the University College Hospital, Gower Street, on April 6 of the present year. An Irishman by birth, possessing many of the admirable qualities of his countrymen, he was born in Dublin, May 12, 1870. He remained in his native place till he came to Kew as a gardener in October, 1891. Having been promoted to the position of label writer he stayed at Kew for six years, winning for himself, by the amiability of his nature, the sterling goodness of his character, and ability considerably above the average, the appreciation of all those with whom he was

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associated. He left Kew in May, 1897, to take up the duties of Forester at Zomba, British Central Africa, where he remained two years and a half. An interval of about a year at home was followed by his appointment as Assistant Curator of the Botanic Garden, Entebbe, Uganda. Shortly after, he became Curator, but in the spring of 1903 his health was so unsatisfactory that he was invalided home. His malady proved to be the terrible "sleeping sickness," a certain, but, in his case, a slow death. He battled manfully against the hopeless disease and the deplorable weakness engendered by it, and for some months, from October, 1903, to April, 1904, was employed as a temporary assistant in the Kew Herbarium. Subsequently he joined the staff of the Imperial Institute, but in the autumn of 1905 his illness necessitated the relinquishment of all work, and the remainder of his life was passed in the hospital, where he lay prostrate and helpless, and often in a comatose condition, till his death on April 6 of the present year, exactly 3 years to the day from the time he left his post in Uganda. His funeral took place at the Richmond Cemetery on April 10, and was attended by several of the permanent staff at Kew and the Imperial Institute. Mahon was married, and his widow now resides in Kew.

The Gardens are indebted to him for liberal contributions of seeds, tubers and plants, and to the Herbarium he sent several small collections of specimens which included a number of new species. The following plants, named in compliment to him, commemorate his services to systematic botany: *Dissotis Mahoni*, Hook. f., Bot. Mag. t. 7896; *Ipomoea Mahoni*, C. H. Wright in Gard. Chron. 1903, xxxiii. p. 257; *Brillantaisia Mahoni*, C. B. Clarke in Kew Bull. 1906, p. 251; *Mystacidium Mahoni*, Rolfe in Kew Bull. 1906, p. 116; and *Lissochilus Mahoni*, Rolfe in Bot. Mag. t. 8047. A portrait of Mahon appeared in the *Gardeners' Chronicle*, 1906, xxxix. p. 256, and his graphic descriptions of Tropical African vegetation were published in the same journal in 1904, xxxv. pp. 115, 130, 165 and 182, and in the *Journal of the Kew Guild*, 1898, p. 17, and 1903, p. 145.

S. A. S.

A. J. JORDAN.— In a letter to the Director, dated Botanical Department, Trinidad, 8th August, 1906, Mr. J. H. Hart has written:—"I regret to report that Mr. A. J. Jordan, of this Department, died after a short illness of some six days on 6th August last of pernicious remittent fever."

The late Mr. Jordan before entering Kew, which he did on May 9, 1898, had been trained at Ballandean House, Inchture, Perthshire, and at Forbes House, Ham, Surrey. In a letter accompanying his application Mr. Jordan speaks of the prospect of entering Kew as one that he had cherished for years, "my object being solely to learn." "A small man, but intelligent and likely" is the expressive comment on his application form.

In 1899 Mr. Jordan was selected for service in the West Indies. He reached Dominica on June 27, 1899, and after spending some time at the Botanic Station there, so as to become accustomed to West Indian conditions, to get to know how to manage native

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labour, to learn the methods of keeping books and become familiar with the details of office work generally, he was posted to Montserrat as Agricultural Instructor, subsequently becoming Curator of the Botanic Station in that Island. Early in 1905, he left Montserrat to become Curator of the Botanic Station in Antigua. Later in the same year he was transferred to Trinidad, where he held charge of the Government House Gardens under Mr. Hart till his death, which occurred, at the age of 32, in the course of what appears to have been a somewhat general outbreak of fever.

Mr. Jordan was a man of sincere religious convictions. He married after reaching the West Indies and has left a widow and one child. With exemplary forethought he had made provision for them by adequately insuring his life.

The Old Cedars at Kew.—The death of one of the fine old Cedars of Lebanon in the gardens unpleasantly reminds us that their numbers are gradually and surely diminishing. The adverse influences of London smoke and a sterile soil no doubt shorten the lives of these trees in Kew, and their decadence has certainly been accelerated by the large proportion of droughty summers experienced in the Thames Valley since 1893. The particular tree whose death we record was one of the group growing near the Pagoda. It was 75 ft. high and its trunk was 14 ft. 2 ins. in circumference near the base, and 11 ft. 7 ins. at 10 ft. from the ground. It contained about 300 cubic ft. of timber. The exceeding minuteness of the layers of wood put on in recent years makes it difficult to ascertain the exact age of this tree by counting the annual rings, but, as near as one can tell, it was between 145 and 150 years old. It is probable, therefore (allowing it to have been a few years old at the time), that it was planted about the time the Pagoda was completed (1762). This is not a great age for the Cedar of Lebanon to attain, for there are specimens still in healthy existence in this country known to be a century older. But unless there comes a revolution in the methods of coal consumption in the metropolis, even that duration of life is not likely to be equalled by the trees planted in Kew during the last 50 years. We have recently learnt from Sir Joseph Hooker—whose recollections of Kew go back more than 60 years—that, within his memory, the Cedars of Lebanon were growing so thickly all round the base of the Pagoda that the ground was quite hidden from the view of anyone looking down from the top. These trees have died one by one till only three remain. The remainder of the big Cedars are disposed about the gardens as follows:—Three on the mound to the west of the Pagoda known to the workmen as "Moss (? Mosque) Hill"; three in the Rhododendron Dell; two in the Herbarium grounds; and one near each of the following sites—Sun Temple, Brentford Gate, Poplar collection, Flagstaff, and Victoria Gate. Most of these (16 in all) girth from 12 to 14 ft. In addition to them, and representing, no doubt, a later planting, are five smaller specimens near the Rhododendron Dell, two near the Director's Office, and one near the sunk Rose Garden.

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The specimen growing near the Flagstaff is rather remarkable for an enormous branch which grows out from the trunk at 6 ft. from the ground and extends in a horizontal direction for 60 ft.; it is 6 ft. 6 ins. in circumference near the trunk.

Lomatia obliqua.—When Mr. H. J. Elwes visited Chili in 1901–2 he collected various seeds which he presented to Kew. Among them were seeds of *Lomatia obliqua*, R. Br., which he found in February "between Quillen and Junin at an elevation of 3–4,000 ft." Junin de los Andes is a town on the Argentine frontier, and the seeds were collected in Argentine territory. Plants were raised from them and some have since been distributed under the name of *Guevina avellana?*, the seedlings bearing a close resemblance to seedlings of that plant. The mature plants, however, differ widely, and it is now clear that Mr. Elwes' plant is *Lomatia obliqua*, which is common in the south of Chili, where it forms a shrub or small tree up to 40 ft. high (Bridges); it is appreciated locally for its prettily grained wood which is used for making furniture. There is no record of this species of *Lomatia* having previously been grown in Europe, and as it is at least as hardy as its relations *Embothrium* and *Stenocarpus*, and is, moreover, an evergreen with large ovate serrated leaves and axillary clusters of white flowers, it is likely to become established in gardens.

Presentations to Museums.—FIBRE FROM UGANDA (*Asclepias semilunata*, N.E. Br.), *Asclepiadeae*.—Mr. M. T. Dawe, Director, Scientific and Forestry Department, Uganda, has forwarded for the Museum a sample of fibre prepared from the stems of this plant, which attains a height of 2–5 ft. and is found in Nile Land, Lower Guinea, and South Central Africa. A report on this fibre appeared in the Bulletin of the Imperial Institute, vol. iii., No. 4, 1906, p. 316.

FIBRE FROM GOLD COAST (*Triumfetta semitriloba*, Jacq., var. *africana*), *Tiliaceae*.—The Cort Development Syndicate, Limited, recently submitted dried specimens of the above plant from the Gold Coast for determination, and subsequently presented samples of fibre obtained from it for the Museum. The fibre had been submitted to a London broker, who reported with regard to it that if clean and uniform in length and strength it would realize about £27 per ton.

FLOSS FROM LABRADOR (*Eriophorum vaginatum*, L.), *Cyperaceae*.—Flowering specimens of this plant collected by Sir W. MacGregor in Chidley Peninsula, Labrador, have been placed in Case 84, Museum No. II.—Under the name of Supput (Eskimo) the silky bristles of the flowers are used to receive sparks from two pieces of pyrites, in making fire.

AUSTRALIAN GRASS WRACK (*Posidonia australis*, Hook. f.), *Naiadaceae*.—A marine plant peculiar to Australian waters. A correspondent recently forwarded for determination a sample of fibre from this plant, with a note to the effect that large quantities

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of the fibre, washed up on the beach in certain places on Spencer's Gulf, are sent to England for the manufacture of gun-cotton. A similar sample was received some time ago from the same locality, with information that it was found on the shore below high-water mark, and about 12 ins. below the surface, the deposit from which the sample was taken being about 6 ft thick, and covering an area of 300 acres.

PRIMITIVE BOXWOOD SUNDIAL.—The Museum is indebted to Mr. Edward Lovett, of Croydon, for a neatly made sundial, such as is used by peasants in the Pyrenees. It is cylindric in shape, 3½ ins. high, and ⅞ in. in diameter. The stile or gnomon is fixed in a slot in the movable head, which may readily be adjusted when required for use. Upright lines at equal distances on the cylinder indicate the hours, whilst letters around the base represent the months of the year. *See* Case 103, Museum No. I.

SEYCHELLES PRODUCTS.—H.E. the Governor of the Seychelles has presented to the Museum a sample of the perfume 'Ylang Ylang,' presumably obtained from the flowers of *Cananga odorata*, Hook. f. & Thoms. (*Anonaceae*), which is the source of the Ylang Ylang oil of commerce. In connection with the trade in this product, particulars given in a recent report by Messrs. Schimmel & Co., of Leipzig and New York, are of interest. It is stated by them that "according to the most recent reports from Manila, dating from the end of January last, there was then a scarcity of blossoms, and the distillation has been interrupted in consequence; but this is now probably past, as a shipment has meanwhile been advised by cable. Our friends in Manila make every possible effort to increase the production to such an extent that the consumption can always be fully satisfied. According to official consular reports the value of Ylang Ylang oil exported from Manila in the year 1904–05 amounted to 100,349 dollars, *i.e.*, about 300 dollars less than in the two preceding years." The sample will be found in Case 2, Museum No. I.

Specimens were at the same time received of the MOZAMBIQUE ORANGE (*Citrus Aurantium*, L., var.), *Rutaceae*, Case 20, Museum No. I; also fruits of CAPUCIN (*Northea sechellana*, Hook. f.), *Sapotaceae*. *See* Case 73, Museum No. I, and drawings 467, 486, and 501 in the North Gallery.

Chinese Wood Oil.—The following passage, taken from the annual *Report on the Botanical and Forestry Department, Hong Kong*, for 1905, by Mr. S. T. Dunn, supplements the information as regards this substance already given on pp. 117–121 of the current volume of the *Bulletin*:—

"WOOD-OIL.—Wood-oil is abundantly produced in the Province "of Fokien and is one of the chief products brought down the "Min from the western part of the Province. At Buong Kang, "near Yenping, there is a large plantation of wood-oil trees, and "as three weeks were spent there during the recent investigation "of the flora of Fokien, the opportunity was taken to ascertain as "much as possible as to the industry. The trees were of two "kinds, locally known as Hwa Tung and Guong Tung. The

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"names refer to the distinguishing character of the fruit, which "is sculptured in the first, smooth in the second. The trees were "in flower and were easily recognised as *Aleurites cordata*, and "another species of the same genus which has been in cultivation "in the Hong Kong Botanic Gardens for many years but has not "yet received a name. I understand from Mr. Hemsley, keeper "of the Kew Herbarium, that it is undescribed and that he has it "in hand at Kew." [Mr. Hemsley has now named this *Aleurites Fordii*, see *Kew Bulletin*, 1906, p. 120.] "The Hwa Tung (*Aleu-"rites cordata*) is the most valued because all the flowers of the "majority of trees produce fruits, from which the oil is made, "while in the second kind a few flowers only in each cluster are "perfect, quite 80 per cent. being male flowers. Why this kind "is planted at all I was unable to discover. The trees are raised "from seed and planted out when about three years old. They "arrive at bearing in five or six years. The nuts are gathered "when ripe, pounded up and placed in the usual Chinese oil "presses. The pressure is applied by wedges, and the oil is "collected and taken to market in a crude state.

"It does not appear to have been suspected before that wood-"oil was a mixture of the products of two species. A sample of "seeds of the new Guong Tung have been secured for trial at the "Imperial Institute, and if they yield oil superior in quality to "the wood-oil of commerce the tree will be tried in the New "Territory."

Professor A. H. Church has called our attention to the following paragraph on Chinese wood-oil in C. H. Hall's "The Chemistry of Paints and Paint Vehicles," p. 90 :—

"The odour is very characteristic and stubbornly resists destruc-"tion, regardless of the manner in which the oil is treated. This "admits of its identification when present in but small proportions "in varnishes, &c., regardless of other constituents. Another very "interesting property is the instant change into a jelly-like sub-"stance when heated to about 285° C. to 300° C. The material "this produces is insoluble in all ordinary solvents, and cannot be "melted by further heating."

In Diplomatic and Consular Reports, Annual Series, No. 3725, p. 96 (1906), Mr. A. Hosie mentions Sesamum Oil, which is only a semi-drying oil, as another oil used as an adulterant of wood-oil.

Prevention of Decay in Ripe Fruit.—In the *Journal of the Board of Agriculture* for 1905, pp. 305-306, an account was given of a series of experiments conducted in the Jodrell Laboratory, Kew, with the object of ascertaining whether, by special treatment, the period during which ripe fruit may be kept in perfect condition is capable of being prolonged.

The rotting or fermentation of ripe fruit having been shown by Pasteur to be due to the presence of living organisms on the surface, the object of the research was to ascertain whether by the destruction of these organisms the processes to which they give rise are preventible. The fruits dealt with consisted of ripe

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cherries, gooseberries, grapes, pears and strawberries, not specially isolated, but purchased from local fruit shops or from street vendors.

The method of treatment employed was simple, inexpensive and free from danger. It consisted of immersion of the fruit for ten minutes in cold water containing 3 per cent. of commercial formalin (=40 per cent. of formaldehyde). The result was to show that whereas similar quantities of untreated pears placed side by side with the disinfected examples had in ten days become so mouldy and decayed as to be unusable, the treated individuals remained perfectly sound. In the case of cherries and gooseberries, seven days; in the case of grapes and strawberries, four days were sufficient to render the untreated examples worthless. In every instance the corresponding samples of fruit were perfectly sound when the untreated samples had become unfit for use. Various preservatives were experimentally tried but having regard to the essential points, efficiency, simplicity, cheapness and freedom from danger in its use, formalin stood easily first.

The method of preservation described appearing likely to be applicable to imported as well as to home-grown fruits has been tested again during 1906, with the result that the experience of the previous year has been confirmed so far as home-grown fruits are concerned. It has also been extended to other fruits such as apples and bananas which are largely imported to this country from oversea, and shows that in these as in the case of the fruits tested during 1905, the treatment described effectively prevents decay. The detailed account of the experience of 1906 will probably appear as a sequel to that of the 1905 experiments and should be consulted. In the meantime the present opportunity is taken of inviting the attention of colonial fruit exporters to the results already obtained and described.

One very important feature of this method of treatment is that it is equally applicable to fruit which is not quite ripe, and that it does not interfere with the normal course of ripening. The flavour is not thus interfered with, as is so often the case when fruit is kept for some time in a refrigerator. Another important feature is that when only the surface of a fruit is affected by the decay due to the presence of these destructive organisms, the cause of the decay is destroyed and the process is sometimes checked.

In the case of fruits like strawberries, which are entirely eaten, the treated fruit should be plunged for five minutes in pure cold water after its removal from the formalin solution. But where the fruit has a rind or skin which is not eaten this is unnecessary and may be omitted with advantage. The fruit after being immersed should be placed on some soft open material to drain and dry.

Botanical Magazine for September.—This number contains figures of *Ficus Krishnae*, C. DC., *Cataseturn galeritum*, Reichb. f., var. *pachyglossum*, Reichb. f., *Ribes viburnifolium*, A. Gray, *Linospadix Micholitzii*, Ridley, and *Cereus Scheerii*, Salm-Dyck. The *Ficus* is a new species most nearly allied to *F. bengalensis*, Linn.,

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and is remarkable in having cup-shaped leaves, the inside of the cup being formed by the under side of the leaf, a condition hitherto unknown. The Kew plant was received from the Royal Botanic Gardens, Calcutta, in 1902, and flowered for the first time in 1905. It is a native of India, but the precise locality is unknown. The variety of the rare Brazilian *Catasetum galeritum* was figured from material sent to Kew by Sir Trevor Lawrence, Bart., with whom it flowered in February last. The female flowers of this species are unknown. *Ribes viburnifolium* is a very distinct species belonging to the section Ribesia, and is a native of Lower California and Santa Catalina Island. The persistent leathery leaves are ovate-orbicular, sharply toothed and gland-dotted. Its small flowers are rosy, followed by small, oblong, red fruits, which often remain on the plant till the succeeding year. The Kew plant—now about seven feet high, trained on a wall—was raised from seed received from the Harvard Botanic Garden in 1897. *Linospadix Micholitzii*, a New Guinea species, is unique in the genus by reason of its unisexual spadices. Its introduction to our gardens is due to Messrs. Sander & Sons, by whom a plant was sent to Kew in 1896. The Mexican *Cereus Scheerii* has been in cultivation at Kew for many years. The plant figured flowered in 1900 and during the two succeeding years. It has since died. The species was named in commemoration of Mr. Frederick Scheer, of Kew, the author of "Kew and its Gardens," published in 1840.

Botanical Magazine for October.—The plants figured are:—*Odonotoglossum naevium*, Lindl., *Abies Mariesii*, Masters, *Blakea gracilis*, Hemsl., *Chloraea virescens*, Lindl., and *Passiflora punctata*, Linn. The *Odontoglossum* is a Colombian species allied to *O. gloriosum*, Lindl. and Reichb., from which it differs in having undulate sepals and petals, and subhastate lateral lobes of the lip. The plant figured flowered at Kew in February last. *Abies Mariesii* is a handsome Japanese species which was first introduced to cultivation by Messrs. James Veitch & Sons through their collector, the late Mr. Charles Maries. The figure was prepared from material sent to Kew by Messrs. D. Stalker & Son, who procured it from a tree growing on the estate of the Earl of Elgin, at Dumphail, near Nairn. This is believed to be the first occasion on which the tree has produced cones in Britain. *Blakea gracilis*, a Melastomaceous plant, native of Costa Rica, has rose-white flowers about an inch and-a-half in diameter. The Kew plant which furnished the material figured was purchased from Messrs. Lemoine & Sons, of Nancy, in 1904. *Chloraea virescens* has been re-introduced from Chili by Mr. H. J. Elwes, F.R.S., who sent plants to Kew, where they flowered in April, 1903. Its flowers are large, yellow veined with green, and are arranged in a dense raceme, four to six inches long. The *Passiflora* is a small-flowered species with sublunate leaves prettily variegated with purple, a native of Colombia, Ecuador, Peru, and Brazil. The figure was prepared from a plant received from the State Botanic Gardens, Brussels, in 1904, under the name of *P. maculata*.

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Botanical Magazine for November.—Figures and descriptions are given of the following plants:—*Lilium myriophyllum*, Franch., *Lycaste dyeriana*, Sander, *Cotyledon devensis*, N. E. Brown, *Ribes cruentum*, Greene, and *Pleione yunnanensis*, Rolfe. The *Lilium* is one of the allies of *L. Brownii*, F. E. Brown, and is a native of Yunnan and North-west Szechuen, having been introduced into cultivation from the last-named province by Messrs. James Veitch & Sons, who supplied the material figured. Franchet, when he described the species, had not seen a bulb, but remarked the presence of a rhizome. Messrs. Veitch sent a specimen bearing a bulb. *Lycaste dyeriana*, a Peruvian species, is curious in having, like *Cattleya citrina*, Lindl., and a few other Orchids, a pendulous habit. The plant drawn was received, in 1903, from the Royal Botanic Garden, Glasnevin; it flowers annually at Kew. The *Cotyledon* is of garden origin, and is probably a hybrid between *C. glauca*, Baker, and *C. gibbiflora*, Baker. The plant is remarkable in the genus on account of its extraordinary stature, having a stem fifteen inches high, and oblanceolate leaves eight to ten inches long, while the flower stems are as much as five to seven feet long. The Kew plant was received from Messrs. Dicksons, of Chester, in 1902. *Ribes cruentum* is a pretty species belonging to the section *Grossularia*, and is a native of the Western United States. Its globose crimson fruits are armed with long straight prickles. The material figured was obtained from a plant purchased from Mr. L. Spaeth in 1899. *Pleione yunnanensis*, from Yunnan, is a new introduction to gardens, and differs from the species already in cultivation by having globose-ovoid pseudobulbs and a taller scape. The drawing was prepared from material sent to Kew by Messrs. Suttons & Sons, Reading.

Lilium Brownii.—The name *Lilium Brownii* has been used for two different plants; first by Poiteau in Rev. Hort. 2me sér., ii., 496 (1843), for a plant which is synonymous with *L. japonicum*, Thunb., Fl. Jap., 133 (1784), and afterwards for another species by F. E. Brown, a nurseryman at Slough, in whose catalogue the name first appeared. A description of the Slough plant was published by Spae in Ann. Soc. Agric. Gand, i., 437, t. 41 (1845), who quoted as the authority "Brown in litt." In the same year this plant was also described by Lemaire and figured in the Flore des Serres, t. 46, and enumerated by Mielle in his catalogue; as a result these writers have sometimes been regarded as the authorities for the specific name. The plant referred to in the Botanical Magazine and now extensively grown as *L. Brownii*, of which several colour forms exist, is this *L. Brownii* of F. E. Brown, not that of Poiteau.

L. japonicum, Thunb. (which is confined to Japan), has glabrous filaments, fewer and irregular bulb-scales, more membranous shortly-petioled leaves, and a more widely campanulate perianth than *L. Brownii*, F. E. Br., while the latter has numerous regularly imbricate bulb-scales, usually sessile leaves and papillose filaments, and is a native of China and the Corean Archipelago.

C. H. W.

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Flora Capensis.—Another part of this work (vol. iv., sect. i., part iii., pp. 337–480) was issued in October, 1906. It contains the remainder of the *Ericaceae* by Mr. N. E. Brown; the *Plumbagineae* by Mr. C. H. Wright; the *Primulaceae*, *Myrsinaceae*, and *Sapotaceae* by the late Dr. W. H. Harvey, with additions by Mr. C. H. Wright; the *Ebenaceae* by Mr. W. P. Hiern; and part of the *Oleaceae* by Dr. W. H. Harvey, with additions by Mr. C. H. Wright. The genera of the *Ericaceae*, apart from the genus *Erica*, constitute one of the most difficult groups in the gamopetalous flowering plants on account of the often exceeding smallness and the glutinous nature of the flowers of many of their species. Twenty-two genera, including four new ones, are described; and out of 159 species 66 are new. The *Plumbagineae* are represented by eleven species of *Statice*, three of *Plumbago*, and *Vogelia africana*. The *Primulaceae* are represented by three species each of *Anagallis* and *Lysimachia*, by the almost cosmopolitan *Samolus Valerandi*, and by *S. porosus*, Thunb., an endemic species. The *Myrsinaceae* and *Sapotaceae* are represented by three genera and eight species, and three genera and sixteen species, respectively. The *Ebenaceae* are relatively numerous, the four genera numbering collectively 37 species.

The late Dr. Harvey's manuscript is printed almost as he left it, except as regards the geography. Strange to say, it contains descriptions of about half-a-dozen new species which nobody had taken up during the interval of 40 years since it was written.

Manual of the New Zealand Flora.—It is now upwards of 40 years since Sir Joseph Hooker's 'Handbook of the Flora of New Zealand' appeared, and botanists have long felt the want of a new edition, or a new work, embodying the results of the always active investigation of the vegetation of that country during this considerable period. In the *Kew Bulletin* for 1899, p. 21, notice was taken of the fragmentary *Students' Flora of New Zealand*, left incomplete owing to the lamented death of Professor T. Kirk. It was then announced that in addition to the publication of the fragment, arrangements had been made for the preparation of a *Flora* of the country on a less comprehensive plan. Now comes Mr. T. F. Cheeseman's admirable 'Manual,' containing descriptions of all the native flowering plants, ferns, and lycopods, &c.—in other words, of all the vascular plants—which shows that there has been an increase of about one-third in the number of species during the period indicated. Unfortunately this book does not fully meet the requirements of local botanists, because New Zealand is in the peculiar position of sheltering upwards of 600 species of plants of foreign origin, many of which are exceedingly abundant. Indeed, in Mr. Cheeseman's words, they now constitute the larger proportion of the Flora in some districts, and there is no part of the country, however remote, into which some plants of foreign origin have not penetrated. Mr. Cheeseman gives a list of the colonists, and expresses a hope that he may be able to publish a companion-volume dealing with this foreign element, for after all it is as necessary for the botanist to know the aliens as to know the natives.

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In the meantime, as a large proportion of them are British, he recommends students to procure Hooker's *Students' Flora of the British Islands.*

W. B. H.

Text-book of Fungi.*—The interest aroused in the fungi by the methods of investigation initiated by De Bary, and the extreme importance of a clear understanding of their relations to other organisms, especially to mankind and to animals and plants of economic value, have resulted in so rich a harvest that the books of even a few years ago are quite inadequate guides to the study of these plants. The old landmarks have been shifted or even swept away, and old problems have been resolved, but only to be replaced by new and still more perplexing ones. New methods of research have opened up new possibilities of advance; and new hypotheses have been framed as to the relations and origins of the several groups. Ideas unfamiliar to the writers of the existing text-books have found expression, and have been fruitful in results, which form a starting point for new investigations. Thus there has arisen a pressing need for a trustworthy guide to the results of recent years, that should state clearly what has been established, and indicate problems in need of investigation. Such a book could be produced only as the fruit of long-continued personal investigation of the structure and life histories of numerous types of fungi, and of intimate acquaintance with the writings of many investigators, scattered through the recent literature of almost every civilized country. Access to the necessary literature can only be obtained in a very few libraries. Few botanists possess the qualifications required in the preparation of such a work, and there is reason to welcome the *Text-book of Fungi* recently issued by Mr. George Massee, whose familiarity with the fungi has been so amply proved by previous books and papers, while the library of the Royal Botanic Gardens at Kew has furnished him with the requisite literature. Even with these advantages the task must have been a very heavy one. The object of the book, it is stated in the preface, is to serve as an introduction to the comparatively new lines of research that have led to so great an advance in our knowledge of fungi from so many new standpoints, and also to indicate where fuller information can be obtained. The field to be surveyed is wide, and one might be excused a doubt if it were possible in a small manual to give an adequate account of the many different lines of progress. But a careful perusal of the book (and it is not one that yields itself to other than careful study) reveals how thoroughly the author has studied these plants and the literature that relates to them; and it also shows how desirous he is to represent truly the opinions held by the several writers, while ready at all times to give reasons for the beliefs held by himself.

The several topics are well arranged, beginning with the cell and its various parts, passing on to the tissues and the anatomy and morphology, then to the methods of reproduction, sexual and

* Text-book of Fungi, including Morphology, Physiology, Pathology, Classification, &c., by George Massee. 8vo. London: Duckworth & Co. 1906.

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asexual, the dispersion and germination of the reproductive cells, the nutrition and effects on them of varied environments, enzymes, and ferments, parasitism and the relations of the parasites to their "hosts," symbiosis, various agencies, chemical and physical, that affect their well-being, and their distribution in space and in time. A chapter on "personal views in phylogeny" opens up several important questions, and will be found both interesting and suggestive, whether the author's views do or do not commend themselves to the reader. The very important practical questions of diseases produced by fungi, and the action of the legislature with a view to checking the spread of disease, receive careful consideration. The last part of the *Text-book* is devoted to the exposition of the systematic groups, in the course of which their relations to one another are discussed, and reasons are adduced for the conclusions arrived at. A most valuable feature is a list, at the close of each section, of all important works relating to it. There are many excellent wood-cuts, which add much to the value and clearness of the exposition. Mr. Massee deserves the thanks of students of fungi for having placed at their service an exceedingly useful and stimulating book, in which they will find aids to further research.

But there are certain features that should be altered in a future edition. Among these are occasional obscurities in expression, which might readily be misunderstood, and would probably be so by one using the book as an introduction to the fungi. It is at times difficult to be sure whether some passage states the author's own view of the question or is quoted by him, but not accepted; *e.g.*, on page 68, one might suppose that he accepted the multiple or polyphyletic origin of fungi from algae, which the statement of his "personal views on phylogeny" shows he does not. In the section on classification the relative subordination of the several grades would be much easier to follow were the names of families and lower grades not all printed in type of the same size, a size, by the way, less important, as regards the appearance of the type, than the frequent heading in capitals "KEY TO . . . " The names of the families and sub-families alike are made to end in *eæ* or *ieæ*, so that there is confusion between these grades when a sub-family of the same name exists within the family, *e.g.*, in "*Perisporieæ*." But these are all minor defects, which detract but slightly from the value of the book as a guide to the study of fungi. Its usefulness will be greatest to those who already possess some knowledge of the subject and can appreciate its merits; the tyro may find both the terms and the ideas somewhat beyond his depth for a time.

Kew Bulletin: Additional Series VII.—The various papers dealing with rubber that have appeared in the *Bulletin* since 1887 have been collected as the third instalment of "Selected Papers from the Kew Bulletin," and issued as the seventh volume of its "Additional Series." The following preface accompanies the reprint:—

"The object of the volumes of 'Selected Papers from the Kew Bulletin,' to which the present one belongs, has been explained

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in the preface to the first selection of the kind, which deals with 'Vegetable Fibres,' and was issued eight years ago.

"The practical value of previous selections has been so great that the issue of the present volume, which deals with 'Rubber,' requires no explanation.

"The arrangement of the papers here reprinted from the pages of the *Kew Bulletin* is that adopted in the selection which deals with 'Fibres'; the notes and papers regarding individual rubber-yielding plants are given in the sequence adopted in the *Genera Plantarum* of Bentham and Hooker, of the natural families to which the various species belong. Those few papers, of a general character, which cannot in their entirety be allocated to particular natural families, and at the same time cannot conveniently be divided into sections, precede the more special articles."

Government Botanist, Western Australia.—We learn with regret of the abolition by the Government of Western Australia of the post of Government Botanist in the Colony held by Mr. A. Morrison.

Index to Kew Bulletin.—An index to the *Bulletin* from its inception in 1887 to the end of the present volume is in course of preparation. This is being issued as an additional appendix (Appendix V.) to the volume for 1906, with the object of enabling those who file the *Bulletin* to bind the general Index with the current volume, or to bind it separately, as may suit their convenience.

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ROYAL BOTANIC GARDENS, KEW.

BULLETIN

OF

MISCELLANEOUS INFORMATION.

APPENDIX I.—1906.

LIST OF SEEDS OF HARDY HERBACEOUS PLANTS AND OF TREES AND SHRUBS.

The following is a select list of seeds of Hardy Herbaceous Plants and of Hardy Trees and Shrubs which, for the most part, have ripened at Kew during the year 1905. These seeds are available only for exchange with Botanic Gardens, as well as with regular correspondents of Kew. No application, except from remote colonial possessions, can be entertained after the end of February.

HERBACEOUS PLANTS.

Abronia arenaria.

Acaena glabra.
macrostemon.
microphylla.
Novae-Zealandiae.
ovalifolia.
pinnatifida.
Sanguisorbae.
trifida.

Acanthus longifolius.

Achillea Ageratum.
Clavenae.
macrophylla.
magna.

Achillea, *cont.*
rupestris.
Tourneforti.

Aconitum barbatum.
Kusnezoffi.
Napellus.
reclinatum.
rostratum.
uncinatum.
vulparia.
Wilsoni.

Actaea alba.
spicata.
— var. rubra.

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Actinella grandiflora.

Actinomeris squarrosa.

Adenophora liliifolia.
polymorpha.
Potanini.
verticillata.

Adenostemma viscosa.

Adesmia muricata.

Adonis autumnalis.
pyrenaica.

Aethionema cappadocicum.
grandiflorum.
pulchellum.
saxatile.

Agrimonia leucantha.
odorata.

Agropyron acutum.
Aucheri.
junceum.
spicatum.
tenerum.
villosum.

Agrostis alba.
capillaris.
elegans.
nebulosa.
vulgaris.

Ajuga Chamaepitys.
orientalis.

Alchemilla alpina.
conjuncta.

Allium albo-pilosum.
angulosum.
atropurpureum.
canescens.
cardiostemon.
Cepa.
derderianum.
giganteum.
globosum.
karataviense.
montanum.
narcissiflorum.
neapolitanum.
nigrum.
odorum.
oleraceum.

Allium, *cont.*
orientale.
ostrowskianum.
paradoxum.
pulchellum.
subvillosum.
Suworowi.
Tubergeni.
zebdanense.

Alstrœmeria aurantiaca.
pulchella.

Althaea armeniaca.
cannabina.
ficifolia.
kurdica.
officinalis.
pallida.
pontica.
rosea.
sinensis.
sulphurea.
taurinensis.

Alyssum argenteum.
creticum.
gemonense.
incanum.
maritimum.
montanum.
rostratum.
spinosum.

Amaranthus caudatus.
hypochondriacus.
polygamus.
speciosus.

Ambrosia artemisiaefolia.
trifida.

Amellus annuus.

Amethystea caerulea.

Ammobium alatum.

Ammophila arundinacea.

Amphoricarpus Neumayeri.

Anacyclus clavatus.
officinarum.
Pyrethrum.

Anaphalis cinnamomea.
nubigena.

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Anchusa capensis.
italica.
officinalis.
sempervirens.

Andropogon halepensis.
Ischaemum.

Andryala integrifolia.
sinuata.
varia.

Anemone apennina.
blanda.
davurica.
decapetala.
elongata.
globosa.
Hepatica.
multifida.
polyanthes.
pratensis.
Pulsatilla.
— var. lilacina.
rivularis.
sulphurea.
sylvestris.

Angelica dahurica.

Anoda hastata.
Wrightii.

Antennaria dioica.

Anthemis austriaca.
blancheana.
cupaniana.
tinctoria.

Anthericum Liliago.
ramosum.

Anthoxanthum odoratum.
Puelii.

Anthriscus cerefolium.
nemorosa.

Antirrhinum Asarina.
Orontium.

Apera interrupta.
Spica-Venti.

Aquilegia chrysantha.
glandulosa.
Kitaibeli.

Arabis alpestris.
alpina.
arenosa.
blepharophylla.
hirsuta.
Holboellii.
muralis.
pumila.

Aralia racemosa.

Arctium intermedium.
majus.
minus.

Arenaria balearica.
capillaris.
cephalotes.
foliosa.
gothica.
graminifolia.
gypsophiloides.
laricifolia.
montana.
pinifolia.
setacea.

Argemone grandiflora.
mexicana.
platyceras.
stenopetala.

Aristida adscensionis.

Aristolochia rotunda.

Armeria alpina.
argyrocephala.
canescens.
juncea.
latifolia.
majellensis.
plantaginea.
pungens.

Arnica Chamissonis.
longifolia.
montana.
sachalinensis.

Arnoseris pusilla.

Artemisia annua.
argentea.
laciniata.
lanata.
paniculata.
parviflora.
rupestris.
scoparia.

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Arthraxon ciliaris.

Asclepias purpurascens.
Sullivantii.
tuberosa.

Asperella Hystrix.

Asperula tinctoria.

Asphodeline brevicaulis.
liburnica.
lutea var. palaestinus.

Asphodelus albus.

Aster alpinus.
canescens.
foliaceus.
Fremonti.
himalaicus.
Porteri.
sibiricus.
tanacetifolius.
Thomsoni.
trinervius.
Tripolium.

Astilbe chinensis.
rivularis.
Thunbergi.

Astragalus alopecuroides.
boeticus.
chinensis.
chlorostachys.
frigidus.
lessertioides.
pendulifiorus.
pentaglottis.
sinicus.

Astrantia Biebersteinii.
helleborifolia.
neglecta.

Athamanta Matthioli.

Atriplex littoralis.
nitens.
rosea.
sibirica.

Atropa Belladonna.

Aubrietia erubescens.
Pinardi.

Baeria coronaria.
gracilis.

Baptisia australis.
leucantha.
leucophaea.

Barbarea arcuata.
intermedia.
praecox.

Basella rubra.

Beckmannia erucaeformis.

Belamcanda punctata.

Berkheya Adlami.
purpurea.

Beta trigyna.

Bidens frondosa.
grandiflora.
leucantha.

Biscutella auriculata.
ciliata.
didyma.
laevigata.

Blumenbachia insignis.

Bocconia cordata.
microcarpa.

Boehmeria cylindrica.

Boenninghausenia albiflora.

Borago laxiflora.
officinalis.

Brachycome iberidifolia.

Brachypodium distachyum.
pinnatum.
sylvaticum.

Brassica alba.
campestris.
— var. chinensis.
Cheiranthos.
Erucastrum.
juncea.

Brevoortia Ida-Maia.

Briza maxima.
minor.

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Bromus adoënsis.
albidus.
breviaristatus.
brizaeformis.
carinatus.
ciliatus.
Kalmii.
macrostachys.
marginatus.
maximus.
Porteri.
pumpelianus.
purgans.
racemosus.
Richardsoni.
rubens.
secalinus.
squarrosus.
Tacna.
tectorum.
Trinii.
unioloides.

Bulbine annua.

Bulbinella Hookeri.

Bunias orientalis.

Buphthalmum salicifolium.

Bupleurum Candollei.
ranunculoides.

Caccinia strigosa.

Calamagrostis confinis.
epigeios.
lanceolata.
varia.

Calandrinia grandiflora.
Menziesii.
umbellata.

Calceolaria mexicana.
plantaginea.
polyrrhiza.

Callirhoë lineariloba.
pedata.

Calochortus Gunnisoni.

Caltha elata.
polypetala.

Camassia Cusickii.
esculenta.
Fraseri.
Leichtlinii.
montana.

Camelina sativa.

Campanula alliariaefolia.
barbata.
bononiensis.
Erinus.
lactiflora.
latiloba.
latifolia.
longistyla.
— var. macrantha.
macrostyla.
michauxoides.
mirabilis.
punctata.
rhomboidalis.
spicata.
sulphurea.
thyrsoides.
Trachelium.

Capsella Heegeri.

Carbenia benedicta.

Cardamine chenopodifolia.

Carduus cernuus.
niveus.
tenuiflorus.

Carex alopecoidea.
aquatilis.
crinita.
Grayii.
hordeistichos.
paniculata.
pendula.
sparganioides.

Carlina acaulis.

Carthamus flavescens.
lanatus.
leucocaulos.
tinctorius.

Carum buriacticum.
copticum.
heterophyllum.

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Catananche cœrulea.
lutea.

Celosia trigyna.

Celsia Arcturus.

Cenchrus tribuloides.

Centaurea amara.
atropurpurea.
Crocodylium.
cynaroides.
dealbata.
Fontanesii.
gymnocarpa.
pulchra.
rupestris.
ruthenica.
salmantica.
solstitialis.
tauromenitana.

Centranthus Calcitrapa.
macrosiphon.
Sibthorpii.

Cephalaria alpina.
ambrosoides.
leucantha.
radiata.
tatarica.
transsylvanica.

Cerastium perfoliatum.
purpurascens.
tomentosum.

Cerinthe alpina.
aspera.
major.

Chaenostoma foetidum.

Chaerophyllum aromaticum.
aureum.
nodosum.

Charieis heterophylla.

Chelidonium franchetianum.
lasiocarpum.

Chelone glabra.
Lyoni.

Chenopodium ambrosoides.
Bonus-Henricus.
hybridum.
Quinoa.

Chenopodium, *cont.*
urbicum.
virgatum.
Vulvaria.

Chloris barbata.
elegans.

Chlorogalum pomeridianum.

Chorispora tenella.

Chrysanthemum carneum.
cinerariaefolium.
corymbosum.
macrophyllum.
multicaule.
palmatum.
setabense.
Zawadski.

Chrysopogon Gryllus.

Chrysopsis villosa.

Cicer arietinum.

Cicuta bulbifera.

Cimicifuga cordifolia.
racemosa.
simplex.

Cladanthus proliferus.

Cladium Mariscus.

Clarkia elegans.
pulchella.

Claytonia asarifolia.

Clematis diversifolia.
integrifolia.

Cleome violacea.

Clintonia borealis.
umbellata.

Clypeola Jouthlaspi.

Cnicus arachnoideus.
canus.
Casabonae.
eriophorus.
oleraceus.
stellatus.
syriacus.

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Cochlearia danica.
glastifolia.
officinalis.

Codonopsis lanceolata.
ovata.
rotundifolia.
Tangshen.

Collinsia bicolor.
verna.

Collomia coccinea.
gilioides.
grandiflora.

Commelina coelestis.
Hasskarlii.

Conringia orientalis.

Convolvulus farinosus.
tricolor.
undulatus.

Coreopsis auriculata.
coronata.
Drummondi.
grandiflora.
lanceolata.

Coriandrum sativum.

Cornucopiae cucullatum.

Coronilla cretica.
scorpioides.

Corydalis capnoides.
cheilanthifolia.
glauca.
lutea.
nobilis.
racemosa.
thalictrifolia.
vesicaria.

Crepis aurea.
blattarioides.
grandiflora.
rubra.
sibirica.

Crinum campanulatum.

Crocus ancyrensis.
aureus.
biflorus var. Weldeni.
cancellatus.
— var. mazziaricus.

Crocus, *cont.*
candidus.
Fleischeri.
hadriaticus.
hermoneus.
Korolkowi.
medius.
pulchellus.
Tourneforti.
vernus.
zonatus.

Crucianella aegyptiaca.

Crupina vulgaris.

Cryptotaenia canadensis.

Cucubalus baccifer.

Cuminum Cyminum.

Cuphea Llavea.
silenoides.
Zimapani.

Cyclamen Coum.

Cynara Scolymus.

Cynoglossum furcatum.
microglochin.
pictum.
Wallichii.

Cynosurus Balansae.
echinatus.

Cypella Herberti.

Cyperus vegetus.

Dactylis aschersoniana.

Dahlia Merckii.

Danthonia Thomasoni.

Daucus gummifer.

Delphinium Ajacis.
Barlowi.
brunonianum.
cashmirianum.
dyctiocarpum.
elatum.
grandiflorum.
hybridum.
maackianum.
pictum.
Pylzowi.

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Delphinium, *cont.*
speciosum.
— var. glabratum.
— var. turkestanicum.
Staphisagria.
vestitum.

Demazeria sicula.

Deschampsia caespitosa.

Desmodium canadense.

Dianthus capitatus.
carthusianorum.
chinensis.
giganteus.
superbus.
sylvestris.

Dictamnus albus.

Digitalis lanata.
lutea.
orientalis.

Dimorphotheca pluvialis.

Diotis candidissima.

Dipcadi serotinum.

Diplachne fusca.

Dipsacus asper.
atratus.
Fullonum.
inermis.
pilosus.
plumosus.

Dischisma spicatum.

Disporum lanuginosum.

Doronicum austriacum.
Columnae.
Orphanidis.

Dorycnium herbaceum.

Draba alpina.
altaica.
carinthiaca.
fladnizensis.
incana.
Kotschyi.
stellata.
streptocarpa.

Dracocephalum moldavicum.
peregrinum.
ruyschiana.
— var. japonicum.
stamineum.
urticaefolium.

Drymaria cordata.

Drypis spinosa.

Eatonia pennsylvanica.

Ecballium Elaterium.

Eccremocarpus scaber.

Echinops exaltatus.
sphaerocephalus.

Echinodorus ranunculoides.

Echium plantagineum.
vulgare.

Ehrharta panicea.

Eleusine coracana.
stricta.

Elsholtzia cristata.

Elymus canadensis.
Caput-Medusae.
condensatus.
giganteus.
sabulosus.
virginicus.

Emilia flammea.

Encelia calva.

Epilobium Dodonaei.
linnaeoides.
montanum.
nummularifolium.
rosmarinifolium.

Epipactis palustris.

Eremostachys laciniata.

Eremurus himalaicus.
Olgae.

Erigeron alpinus.
compositus.
divergens.
glabellus.
glaucus.

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Erigeron, *cont.*
macranthus.
multiradiatus.
philadelphicus.
strigosus.
trifidus.

Erinus alpinus.

Erodium Botrys.
chium.
ciconium.
gruinum.
malacoides.
Manescavi.
moschatum.

Eruca sativa.

Eryngium alpinum.
amethystinum.
campestre.
dichotomum.
ebracteatum
giganteum.
maritimum.
oliverianum.
palmatum.
pandanifolium.
planum.
Spinalba.
vesiculosum.
Zabelii.

Erysimum perofskianum.

Erythraea capitata.
Massoni.

Erythronium giganteum.
Johnsoni.
revolutum.

Eschscholzia caespitosa.
californica.
Douglasii.

Eucharidium Breweri.
concinnum.

Eupatorium maculatum.
perfoliatum.
purpureum.
serotinum.

Euphorbia altissima.
Characias.
coralloides.
dentata.

Euphorbia, *cont.*
Esula.
kotschyana.
marginata.
spinosa.
terracina.
Wulfeni.

Euthamia leptocephala.

Fedia Cornucopiae.

Felicia fragilis.
tenella.

Ferula communis var. glauca.
monticola.
tingitana.

Festuca bromoides.
Eskia.
foliosa.
Halleri.
Myuros.
rigida.
scoparia.
tenuiflora.

Foeniculum dulce.
virescens.

Frankenia pulverulenta.

Frasera caroliniana.

Fritillaria acmopetala.
acutiloba.
armena.
aurea.
askabadensis.
citrina.
Imperialis.
lutea.
pontica.
tenella.

Funkia lancifolia.
ovata.
sieboldiana.

Gaillardia amblyodon.
aristata.

Galactites tomentosa.

Galega orientalis.
patula.

Galeopsis pyrenaica.
Tetrahit.

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Galium recurvum.
tenuissimum.
tricorne.

Gastridium australe.

Gaudinia fragilis.

Gaura oenotheriflora.
parviflora.

Gentiana asclepiadea.
Cruciata.
lutea.
phlogifolia.
Saponaria.
septemfida.
tibetica.

Geranium albiflorum.
albanum.
anemonaefolium.
armenum.
incisum.
macrorrhizum.
rivulare.
sanguineum.

Gerbera Anandria.
kunzeana.
nivea.

Geum album.
chiloense.
elatum.
Heldreichii.
macrophyllum.
montanum.
pyrenaicum.
rhaeticum.

Gilia androsacea.
capitata.
densiflora.
dianthoides.
squarrosa.
tricolor.

Glaucium corniculatum.
flavum.
— var. fulvum.
— var. tricolor.

Glycine Soja.

Glycyrrhiza echinata.

Grammanthes gentianoides.

Grindelia glutinosa.
humilis.
inuloides.
squarrosa.

Gymnolomia multiflora.

Gynandropsis speciosa.

Gypsophila elegans.
libanotica.
muralis.
paniculata.
repens.
Steveni.

Hablitzia tamnoides.

Halenia Perrottetii.

Hastingia alba.

Hebenstreitia comosa.
tenuifolia.

Hedysarum boreale.
coronarium.
esculentum.
flexuosum.
microcalyx.
obscurum.

Helenium Bigelovii.
Bolanderi.
puberulum.

Helianthus laetiflorus.
Nuttallii.
occidentalis.
tuberosus.

Helichrysum bracteatum.
thianshanicum.

Heliophila amplexicaulis.
crithmifolia.

Heliopsis laevis.

Helipterum corymbosum.
Manglesii.
roseum.

Helonias bullata.

Hemerocallis Dumortieri.
flava.
Middendorfii.
Sieboldi.
Thunbergii.

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Heracleum granatense.
gummiferum.
lehmannianum.
Panaces.
persicum.
Wallichii.

Herniaria glabra.
hirsuta.

Hesperis matronalis.

Hibiscus Trionum.

Hieracium amplexicaule.
aurantiacum.
Bocconi.
Bornmülleri.
corymbosum.
Heldreichii.
lanatum.
maculatum.
pannosum.
villosum.
vulgatum.

Hilaria rigida.

Hippocrepis multisiliquosa.
unisiliquosa.

Hordeum bulbosum.
jubatum.
maritimum.

Hosackia purshiana.

Hyacinthus amethystinus.
azureus.
orientalis.
romanus.

Hydrophyllum virginicum.

Hyoscyamus albus.
aureus.

Hypecoum grandiflorum.
procumbens.

Hypericum hirsutum.
montanum.
rhodopeum.

Iberis Amara.

Illecebrum verticillatum.

Impatiens amphorata.
Roylei.
scabrida.
Thomsoni.

Incarvillea Delavayi.
variabilis.

Inula barbata.
ensifolia.
Hookeri.
macrocephala
orientalis.
squarrosa.
thapsoides.

Ionopsidium acaule.

Iris albo-purpurea.
aurea.
caucasica.
Clarkei.
Delavayi.
ensata.
foetidissima.
— var. citrina.
graminea.
laevigata.
Milesii.
prismatica.
setosa.
tectorum.
watsoniana.

Isatis glauca.
Villarsii.

Isopyrum fumarioides.

Iva xanthifolia.

Jasonia tuberosa.

Juncus alpinus.
Chamissonis.
tenuis.

Jurinea ambigua.

Kitaibelia vitifolia.

Kniphofia kewensis.
foliosa.
pauciflora.
rufa.
Tuckii.
Tysoni.

Kochia arenaria.
scoparia.

Koeleria albescens.
phleoides.
setacea.

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Lactuca Bourgaei.
hastata.
macrophylla.
muralis.
Plumieri.

Lagascea mollis.

Lagurus ovatus.

Lallemantia canescens.
iberica.
peltata.
royleana.

Lamarckia aurea.

Laserpitium hispidum.
Siler.

Lasiospermum radiatum.

Lasthenia glabrata.

Lathyrus angulatus.
Aphaca.
articulatus.
Cicera.
cirrhosus.
Clymenum.
latifolius.
luteus.
maritimus.
montanus.
niger.
Nissolia.
Ochrus.
odoratus.
pisiformis.
polyanthus.
rotundifolius.
setifolius.
sphaericus.
tingitanus.
tuberosus.
undulatus.
variegatus.
venosus.
violaceus.

Lavatera cachemiriana.
thuringiaca.
trimestris.

Layia elegans.
glandulosa.
platyglossa.

Lens esculenta.

Leonurus Cardiaca.
sibiricus.
tataricus.

Lepachys columnaris.

Lepidium campestre.
Menziesii.

Leptosyne Douglasii.
maritima.

Lepturus cylindricus.

Leuzea conifera.

Liatris scariosa.
spicata.

Libertia formosa.
grandiflora.

Ligusticum alatum.
pyrenaicum.
scoticum.
Seguieri.

Limnanthes alba.
Douglasii.

Linaria anticaria.
bipartita.
dalmatica.
Elatine.
maroccana.
origanifolia.
purpurea.
reticulata.
saxatilis.
triphylla.
viscida.

Lindelofia spectabilis.

Linum augustifolium.
flavum.
monogynum.
narbonense.
nervosum.
usitatissimum.

Loasa lateritia.
vulcanica.

Lobelia sessilifolia.
syphilitica.

Lolium multiflorum.

Lopezia coronata.

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Lophanthus urticifolius.

Lotus edulis.
ornithopodioides.
Requienii.
Tetragonolobus.

Lunaria biennis.

Lupinus albus.
arboreus.
cosentinus.
Cruckshanksii.
diffusus.
elegans.
Hartwegii.
micranthus.
pubescens.
tricolor.

Luzula albida.
Fosteri.
Hostii.
nivea.
pilosa.

Lychnis alpina.
Chalcedonica.
Coeli-rosa.
corsica.
Flos-jovis.
Githago.
haageana.
Lagascae.
pyrenaica.

Lycurus phleoides.

Lythrum Graefferi.
hyssopifolia.

Madia dissitiflora.
elegans.

Malcolmia chia.
flexuosa.
littorea.
sinuata.

Malope trifida.

Malva Alcea.
Duriaei.
oxyloba.
rotundifolia.

Malvastrum limense.

Martynia proboscidea.

Matricaria Tchihatchewii.

Matthiola sinuata.

Mazus rugosus.

Meconopsis aculeata.
cambrica.
heterophylla.
paniculata.
Wallichii.

Medicago Echinus.
falcata.
hispida.
littoralis.
marina.
minima.
murex.
scutellata.
turbinata.

Melanthium virginicum.

Melica altissima.
ciliata.
nutans.
uniflora.

Melilotus alba.
officinalis.

Melissa officinalis.

Melittis Melissophyllum.

Mentzelia Lindleyi.

Mesembryanthemum pyropeum.

Meum Athamanticum.

Mibora verna.

Milium effusum.

Mimulus cardinalis.
luteus.

Mirabilis divaricata.

Modiola multifida.

Molinia cœrulea.

Molopospermum cicutarium.

Monolepis trifida.

Moricandia arvensis.

Moscharia pinnatifida.

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Muscari armeniacum.
Bourgaei.
comosum.
compactum.
latifolium.
polyanthum.
szovitzianum.

Myagrum perfoliatum.

Myriactis Gmelini.
Wallichii.

Myosuros minimus.

Nardus stricta.

Nemophila insignis.
maculata.
Menziesii.
parviflora.

Nepeta caesarea.
Cataria.
Mussini.
nuda.
tuberosa.

Neslia paniculata.

Nicandra physaloides.

Nicotiana Langsdorffii.
paniculata.

Nigella arvensis.
damascena.
orientalis.
sativa.

Nolana prostrata.

Ocimum Basilicum.

Œnanthe Lachenalii.
pimpinelloides.
silaifolia.

Œnothera albicaulis.
amoena.
densiflora.
glauca.
nocturna.
pumila.
riparia.
rosea.
sinuata
tenella.
tetraptera.
Whitneyi

Omphalodes linifolia.

Ononis alopecuroides.
Natrix.
rotundifolia.

Onosmodium Thurberi.

Opoponax Chironium.

Ornithogalum arcuatum.
fimbriatum.
narbonense.
pyrenaica.

Ornithopus sativus.

Orobanche Hederae.
flava.

Ostrowskia magnifica.

Oxyria digyna.

Oxybaphus nyctagineus.

Pallenis spinosa.

Panicum bulbosum.
Crus-galli.
Isachne.
miliaceum.
sanguinale.
Teneriffae.

Papaver alpinum.
apulum.
arenarium.
Argemone.
commutatum.
glaucum.
laevigatum.
nudicaule.
pavoninum.
persicum.
rupifragum.
somniferum.

Parnassia caroliniana.

Paspalum dilatatum.

Pelargonium australe.

Pennisetum longistylum.
macrourum.

Pentstemon barbatus.
campanulatus.
coeruleus.
confertus.

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Pentstemon, *cont.*
deustus.
diffusus.
glaber.
gracilis.
heterophyllus.
humilis.
linarioides.
ovatus.
secundiflorus.
spectabilis.
tubiflorus.

Petunia nyctaginiflora.

Peucedanum sativum.

Phaenosperma globosa.

Phleum arenarium.
alpinum.
Michelii.

Physalis Alkekengi.
Francheti.
peruviana.

Phlomis agraria.
setigera.
tuberosa.
viscosa.

Physochlaina orientalis.

Physostegia virginiana.

Phyteuma Michelii.
orbiculare.

Phytolacca acinosa.
icosandra.

Platycodon grandiflorum.

Picridium tingitanum.

Plantago amplexicaulis.
arenaria.
Candollei.
Coronopus.
Lagopus.
maritima.
maxima.
ovata.
Psyllium.
virginica.

Platystemon californicus.

Pleurospermum Golaka.
pulchrum.

Plumbago micrantha.

Poa abyssinica.
nevadensis.
violacea.

Polemonium foliosissimum.
mexicanum.

Polygonatum biflorum.
commutatum.
verticillatum.

Polygonum alpinum var. polymorphum.
capitatum.
orientale.
viviparum.
Weyrichii.

Polypogon littoralis.
maritimus.
monspeliensis.

Portulaca grandiflora.

Potentilla alpestris.
arguta.
argyrophylla.
Detommasii.
Fenzlii.
glandulosa.
gracilis.
Griffithii.
hippeana.
hirta.
leuconota.
mollis.
montenegrina.
multifida.
nepalensis.
pyrenaica.
recta.
sericea.
tanacetifolia.
trifurcata.
villosa.

Poterium alpinum.
canadense.

Pratia angulata.
begonifolia.

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Primula denticulata.
frondosa.
japonica.
mollis.
rosea.
variabilis.

Prunella grandiflora.
hyssopifolia.

Psoralea macrostachya.
physodes.

Pulicaria vulgaris.

Puschkinia scilloides.

Queria hispanica.

Ramondia pyrenaica.

Ranunculus auricomus.
Chius.
Cymbalaria.
falcatus.
Nelsoni.
trilobus.

Rehmannia angulata.

Relhania sessilifolia.

Rhagadiolus edulis.

Rheum Emodi.
Rhaponticum.
webbianum.

Rodgersia pinnata.

Roemeria hybrida.

Romulea Bulbocodium.
Columnae.
Requienii.

Rudbeckia ampla.
amplexicaulis.
californica.

Rumex alpinus.
bucephalophorus.
salicifolius.

Sagina nodosa.

Salsola Kali.
— var. Tragus.

Salvia amplexicaulis.
argentea.
campanulatus.
carduacea.
Columbariae.
farinacea.
glutinosa.
Horminum.
japonica.
nutans.
Przewalskii.
regeliana.
Sclarea.
taraxacifolia.
tiliaefolia.
umbratica.

Sambucus Ebulus.

Saponaria orientalis.

Saussurea discolor.

Saxifraga cartilaginea.
cochlearis.
crustata.
erosa.
hirsuta.
lingulata.
— var. lantoscana.
macnabiana.
marginata.
peltata.
rocheliana, var. coriophylla.
rotundifolia.
Sibthorpii.
tenella.

Scabiosa atropurpurea.
balcanica.
candolleana.
caucasica.
graminifolia.
gramuntia.
isetensis.
lucida.
leucophylla.
longifolia.
macedonica.
monspeliensis.
prolifera.
Pterocephala.
vestina.

Scilla amethystina.
bifolia.
Hohenhackeri.

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Scilla, *cont.*
hispanica.
Lilio-Hyacinthus.
messeniaca.
patula.
peruviana.
pratensis.
verna.

Scirpus Caricis.
Eriophorum.
triqueter.

Scleranthus annuus.

Scolymus hispanicus.
maculatus.

Scopolia sinensis.
tangutica.

Scorpiurus vermiculata.

Scrophularia alata.
vernalis.

Scutellaria altissima.

Secale cereale.
dalmaticum.

Securigera Coronilla.

Selinum serbicum.
vaginatum.

Senecio aconitifolius.
alpinus.
chrysanthemoides.
Doria.
elegans.
Hodgsoni.
Ledebouri.
Ligularia.
nemorensis.
sibiricus.
songaricus.
tanguticus.

Serratula coronata.
Gmelini.
quinquefolia.

Seseli Libanotis.
tenuifolium.

Sesleria cœrulea.

Setaria glauca.
italica.
vulpiseta.

Sida Napæa.

Sidalcea candida.
Listeri.
malachroides.
malvaeflora.
spicata.

Siderites scordioides.

Silaus flavescens.

Silene alpestris.
asterias.
ciliata.
clandestina.
colorata.
conoidea.
cretica.
fimbriata.
Fortunei.
fuscata.
glauca.
italica.
juvenalis.
longicilia.
melandrioides.
Muscipula.
noctiflora.
nutans.
odontopetala.
pendula.
quadrifida.
rubella.
squamigera.
stylosa.
Tanakae.
tatarica.
tenuis.
verecunda.
virginica.
Zawadskii.

Silphium integrifolium.
scaberrimum.
trifoliatum.
— var. ternatum.

Silybum eburneum.
Marianum.

Sisymbrium junceum.
polyceratum.
strictissimum.

Sisyrinchium angustifolium.
iridifolium.
striatum.

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Sium lancifolium.

Sophora flavescens.

Spartina polystachya.

Sphaeralcea acerifolia.

Sporobolus asper.
cryptandrus.

Stachys Alopecuros.
alpina.
annua.
græca.
grandiflora.
lanata.
longifolia.
recta.
setifera.

Statice Bonduelli.
Limonium.
Suworowi.
tatarica.

Stenanthium robustum.

Stevia Eupatoria.
serrata.

Stipa Aristella.
arundinacea.
Calamagrostis.
gigantea.
papposa.
pennata.
viridula.

Stylophorum diphyllum.

Swertia connata.
longifolia.

Symphyandra Hofmanni.
pendula.
Wanneri.

Symphytum asperrimum.
orientale.

Telephium Imperati.

Tellima grandiflora.

Tetragonia crystallina.
expansa.

Teucrium Botrys.
hyrcanicum.
multiflorum.
oxyodon.

Thalictrum angustifolium.
calabricum.
odorum.
purpurascens.
squarrosum.

Thermopsis caroliniana.
fabacea.
montana.

Thladiantha dubia.

Thlaspi alpestre.
perfoliatum.
violascens.

Tolpis barbata.

Tragus racemosus.

Trautvetteria palmata.

Tricholepis furcata.

Tricyrtis latifolia.

Trifolium agrarium.
angustifolium.
alpestre.
clypeatum.
fragiferum.
glomeratum.
Johnstoni.
leucanthum.
maritimum.
pannonicum.
Perreymondi.
physodes.
resupinatum.
scabrum.

Trigonella corniculata.
caerulea.
cretica.
Foenum-graecum.
ovalis.
polycerata.
radiata.

Trillium grandiflorum.

Trinia Kitaibelii.

Triosteum perfoliatum.

Trisetum distichophyllum.
flavescens.

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Triticum Aegilops.
amyleum.
caudatum.
dicoccum.
monococcum.
ovatum.
polonicum.
Requienii.
Spelta.
turgidum.
ventricosum.

Troximon grandiflorum.

Tunica olympica.
Saxifraga.

Typha latifolia.

Tyrimnus leucographis.

Ursinia pulchra.

Urtica pilulifera.
— var. balearica.

Uvularia grandiflora.

Valeriana Phu.
pyrenaica.

Valerianella Auricula.
carinata.
coronata.
dentata.
echinata.
eriocarpa.
vesicaria.

Venidium perfoliatum.

Veratrum nigrum.

Verbascum Chaixii.
epixanthinum.
Haensleri.
phœniceum.

Verbena bonariensis.
hastata.
polystachya.

Verbesina helianthoides.

Veronica acinifolia.
Bidwillii.
crassifolia.
glauca.

Veronica, *cont.*
incana.
Ponae.
saxatilis.
spicata.
virginica.
— var. japonica.

Vicia atropurpurea.
calcarata.
fulgens.
gigantea.
hirsuta.
lutea.
— var. hirta.
melanops.
narbonensis.
pisiformis.
pyrenaica.
sicula.
sylvatica.
unijuga.

Vincetoxicum fuscatum.
nigrum.
officinale.

Viola arenaria.
cornuta.
elatior.
Nuttallii.
palustris.
pratensis.
persicifolia.
sagittata.
sylvestris

Volutarella Lippii.
muricata.

Wahlenbergia pendula.
undulata.

Waitzia grandiflora.

Xanthium macrocarpum.

Xanthocephalum gymnospermoides.

Zizia aurea.

Ziziphora tenuior.

Zygadenus elegans.
glaberrimus.
muscitoxicum.

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TREES AND SHRUBS.

Those marked with an asterisk were not grown at Kew.

Abies brachyphylla.
*firma.
*magnifica var. xanthocarpa.
*parryana.
*sibirica.

Acanthopanax sessiliflora.

Acer circinatum.
coriaceum.
Heldreichii.
*Hookeri.
hyrcanum.
insigne.
macrophyllum.
*Miyabei.
monspessulanum.
neglectum.
opulifolium.
— var. neapolitanum.
*sikkimense.
*striatum.
*tataricum.
Trautvetteri.
Van Volxemi.

Ailanthus glandulosa.

Alnus cordifolia.
firma.
incana.
japonica.
oregona.
orientalis.
rhombifolia.
viridis.

Amelanchier alnifolia.
vulgaris.

Aplopappus ericoides.

Aralia chinensis.

Arbutus Menziesii.
Unedo.

*Arctostaphylos glauca.
*— pungens.
*— tomentosa.

Baccharis halimifolia.
patagonica.

Berberis aristata.
Darwinii.
sinensis.
stenophylla.
Thunbergii.
virescens.
wallichiana.

Betula Ermani.
fruticosa.
lenta.
lutea.
Maximowiczii.
occidentalis.
populifolia.
ulmifolia.

Bruckenthalia spiculifolia.

Buddleia globosa.
japonica.
variabilis.

*Bumelia lanuginosa.
*— rigida.

*Calycanthus glaucus.
occidentalis.

Caragana arborescens.
— var. Redowskii.

Carmichaelia australis.
flagelliformis.

*Carpinus cordata.
*— yedoensis.

Cassinia fulvida.
leptophylla.

*Catalpa speciosa.

*Ceanothus ovatus.

Cedrus atlantica.

Celastrus articulatus.

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*Celtis aspera.
occidentalis.
pumila.
sinensis.
Tournefortii.

Cephalotaxus pedunculata.

*Cistus albidus.
corbariensis.
hirsutus.
laurifolius.
villosus.
— var. creticus.

Cladrastis amurensis.

Clematis aethusifolia.
— var. latisecta.
alpina.
crispa.
fusca.
Hendersonii.
heracleaefolia.
integrifolia.
intermedia.
mongalica.
orientalis.
— var. tangutica.
Viticella.

Clerodendron trichotomum.

Clethra acuminata.
— alnifolia.
— canescens.

Colutea arborescens.
cruenta.
longialata.

Cornus alba.
Amomum.
Baileyi.
candidissima.
circinata.
glabrata.
stolonifera.

Coronilla Emerus.

Cotoneaster acutifolia.
affinis.
bacillaris.
buxifolia.

Cotoneaster, *cont.*
frigida.
horizontalis.
Lindleyi.
microphylla.
*— var. glacialis.
Nummularia.
pannosa.
rotundifolia.
Simonsii.
thymifolia.

*Crataegus acutiloba.
*aestivalis.
Carrierei.
coccinea.
*coccinoides.
cordata.
crenulata.
Crus-Galli.
*Gravesii.
*latispina.
*laurentiana.
*laxiflora.
macracantha.
melanocarpa.
mollis.
nigra.
orientalis.
*pastorum.
*Peckii.
punctata.
— var. xanthocarpa.
Pyracantha.
*sextilis.
*subrotundifolia.
succulenta.
tanacetifolia.
tomentosa.

Cryptomeria japonica.

*Cupressus Benthami var. arizonica.
lawsoniana.
*lusitanica.
obtusa.
pisifera.
thyoides.

Cydonia japonica.
Maulei.

Cyrilla racemiflora.

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Cytisus albus.
biflorus.
capitatus.
Heuffeli.
nigricans.
praecox.
purpureus.
sessilifolius.

Daboëcia polifolia.

*Daphniphyllum himalayense.

*Desmodium polycarpum.
*tiliaefolium.

Deutzia corymbosa.
scabra.
sieboldiana.

Diervilla rivularis.
sessilifolia.

*Diospyros Lotus.

Elaeagnus multiflora.
umbellata.

Erica arborea.
ciliaris.
— var. maweana.
multiflora.
scoparia.
stricta.
Tetralix.
vagans.

Escallonia philippiana.

Euonymus latifolius.

*Fatsia horrida.

Fraxinus Mariesii.
Ornus.

Gaultheria Shallon.

Genista aethnensis.
cinerea.
pilosa.
tinctoria var. elatior.
virgata.

Halesia corymbosa.

*Hamamelis virginica.

Helianthemum halimifolium.

Hippophaë rhamnoides.
salicifolia.

Hydrangea Bretschneideri.
petiolaris.
vestita.

Hypericum Androsaemum.
corymbosum.
elatum.
moserianum.

Idesia polycarpa.

*Ilex insignis.
laevigata.
*monticola.
opaca.
verticillata.

Indigofera gerardiana.

Jasminum humile.

Juniperus chinense.
*monosperma.
*rigida.
*scopulorum.

Kalmia angustifolia.
latifolia.

Laburnum alpinum.

Larix leptolepis.
occidentalis.

Ledum palustre.

Leucothoe axillaris.
Catesbaei.
*recurva.

Ligustrum Ibota var. regelianum
japonicum.

Lonicera alpigena.
alpina.
chrysantha var. turkestanica.
etrusca.
glabrata.
involucrata.
Morrowii.
nigra.
orientalis.
pileata.
segreziensis.
Sullivanti.
Xylosteum.

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Lupinus arboreus.

Lycium chinense.

Magnolia hypoleuca.

Metaplexis Stauntoni.

Microglossa albescens.

Myrica cerifera.

Myricaria germanica.

Neillia amurensis.
opulifolia.
thyrsiflora.

Nuttallia cerasiformis.

Olearia Haastii.

Ononis fruticosa.
rotundifolia.

Paliurus australis.

Paulownia imperialis.

Pernettya mucronata.

Petteria ramentacea.

*Phellodendron japonicum.
*— sachalinense.

Philadelphus acuminatus.
cordifolius.
coronarius.
gordonianus.
grandiflorus.
Lemoinei.
Lewisii.
microphyllus.
Satsumi.

*Photinia integrifolia.

Picea alba.
nigra.

Picrasma quassioides.

Pieris floribunda.
japonica.

*Pinus montana var. gallica.
*murrayana var. Sargenti.

Piptanthus nepalensis.

*Platanus occidentalis.
*racemosa.

Potentilla fruticosa.
salesoviana.

Prunus acuminata.
*Andersoni.
humilis.
japonica.
Mahaleb.
*maritima.
*nepalensis.
pumila.
*subcordata.
*undulata.
*utahensis.
*Watsoni.

Ptelea trifoliata.

Pyrus alnifolia.
alpina.
arbutifolia.
Aria.
Aucuparia var. dulcis.
var. fructu luteo.
Balansae
canescens.
Chamaemespilus.
coronaria.
crataegifolia.
decaisneana.
floribunda.
Hostii.
intermedia.
lanata.
lobata.
nigra.
prunifolia.
Ringo.
rotundifolia.
Scheideckeri.
sikkimensis.
sinaica
sinensis.
Sorbus.

Rhamnus caroliniana.
catlıartica.
crenata.
Frangula.
nepalensis.

*Rhododendron albiflorum.
*Anthopogon.
campanulatum.
campylocarpum.
cinnabarinum.
intermedium.

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Rhodotypus kerrioides.

*Rhus aromatica.
*glabra.
*Osbeckii.
*ovata.
*succedanea.
typhina.

Ribes alpinum.
cruentum.
stenocarpum.

Robinia Pseudacacia.

Rosa lucida.
Sayi.
Woodsii.

Rubus leucodermis.
nutkanus.
occidentalis.
parvifolius.
phoenicolasius.
xanthocarpus.

*Sambucus callicarpa.
melanocarpa.
*pubens.

*Sassafras officinale.

Schizophragma hydrangeoides.

Skimmia japonica.

Smilax rotundifolia.

Sophora viciifolia.

Spartium junceum.

Spiraea Aitchisoni.
albiflora.
betulifolia.
brachybotrys.
bracteata.
bullata.
canescens.
concinna.
discolor.
Douglasi.
expansa.
Foxii.
intermedia.
lindleyana
Margaritae.

Spiraea, *cont.*
Menziesii.
microthyrsa.
nobleana.
pachystachys.
rubra.
salicifolia.
tomentosa.

Staphylea colchica.
pinnata.

Styrax japonica.

Symphoricarpus acutus.
Heyeri.

Symplocos crataegoides.

Taxus baccata.
cuspidata.

Thuya japonica.
orientalis.
plicata.

Tilia cordata.

*Tsuga canadensis.
*caroliniana.

Vaccinium erythrocarpum.

Viburnum acerifolium.
dentatum.
dilatatum.
*foetens.
lantanoides.
molle.
nepalense.
Opulus.
phlebotrichum.
*rufotomentosum.
Sargenti.
Tinus.
*venosum.

Vitis arizonica.
rupestris.
vulpina.

*Zanthoxylum Bungei.
planispinum.

Zenobia speciosa.
— var. pulverulenta.

*Zizyphus vulgaris.

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ROYAL BOTANIC GARDENS, KEW.

BULLETIN

OF

MISCELLANEOUS INFORMATION.

APPENDIX II.—1906.

NOTE.

In the preface to the *Catalogue of the Library of the Royal Botanic Gardens*, which was issued as Volume III. of the *Additional Series* of the *Kew Bulletin*, it was stated that annual lists of future additions would be published in the *Bulletin*.

The present instalment contains the additions made to the Library by gift or purchase during the year 1905, with the exception of such current periodicals and annuals as continue sets already catalogued.

Like the Catalogue, the List is printed on one side of the page, to allow of its being cut up. It is probable that many persons and institutions will make the Kew Catalogue the basis of their own, and will use the lists of additions to supply printed slips for fresh titles.

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CATALOGUE OF THE LIBRARY.

Additions received during 1905.

§ 1.—GENERAL.

Addison, Joseph. An essay on the pleasures of the Garden. (Reprinted from The Spectator, 1712.) London, 1893. 8vo.

Aiton, William, *of Strathaven.* A treatise on the origin, qualities, and cultivation of moss-earth. Glasgow, 1805. 8vo.

Alcock, Randal Hibbert. Botanical names for English readers. London, 1876. 8vo.

Aldrovandi, Ulisse. Cinque lettere di L. GHINI ad U. A. See **De Toni, G. B.**

Altamirano, Fernando. El Palo Amarillo, *Euphorbia elastica,* Altamirano y Rose, sp. nov. (Mexico, 1905.) 8vo.

Andrews, Albert Edward. See **Dunstan, W. R.**

Annesley, Hugh, 5th Earl. Beautiful and rare Trees and Plants. [*Followed by*] A list of Plants hardy in the garden at Castlewellan, 1903. London (1903). 4to.

Arber, Edward Alexander Newell. The sporangium-like organs of *Glossopteris browniana,* Brongn. (Quart. Journ. Geol. Soc. lxi.) [London], 1905. 8vo.

Arcangeli, Giovanni & Others. Adjonctions au code de Paris de 1867 proposées par quelques botanistes italiens. (Also in Italian and German.) Florence, 1904. 8vo.

Arechavaleta, José. Flora uruguaya. Tomo i. [-ii.] (An. Mus. Nac. Montevideo, iii. & v.) Montevideo, 1901–05. 1a. 8vo.

Argotti Botanic Gardens. See **Malta.**

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Ashe, William Willard. Some new species of the genus *Cratægus* and notes on some dichotomous Panicums. (North Carolina Coll. Agric. Bull. 175.) West Raleigh, 1900. 8vo.

Atkinson, George Francis. On the homologies and probable origin of the Embryo-Sac. (Science, N. S. xiii.) [New York] (1901.) 4to.

Atlases. "The Times" Atlas. New edition. London, 1900. fol.

—— The Oxford Atlas of the British Colonies. Part I. British Africa. Oxford, [1905.] 4to.

Atterberg, Albert. Die Varietäten und Formen der Gerste. (Journ. f. Landwirtsch. 1899.) [Berlin, 1899.] 8vo.

Babington, Charles Cardale. Memorials journal and botanical correspondence of C. C. B. (Edited with a preface by A. M. B.) Cambridge, 1897. 8vo.

Bahama (The) Islands. See **Shattuck, G. B.**

Baillon, Henri Ernest. Iconographie de la flore française. Cent. I—V. Paris [1885–94]. 5 vols. 12mo.

Baldacci, Antonio. Risultati botanici e fitogeografici delle due missioni scientifiche italiane del 1902 e 1903 nel Montenegro. (Rend. Accad. Sc. Ist. Bologna, N. S., viii.). Bologna, 1904. 8vo.

—— Sulle foreste del Montenegro, dell' Albania e dell' Epiro. (Boll. Ministero Agric. Roma, 1904.) (Roma, 1904.) 8vo.

—— La vegetazione autunnale della Volovica (Montenegro) in rapporto all' influenza della bòra. (Mem. Accad. Sc. Ist. Bologna, 6, ii.) Bologna, 1905. 4to.

Balfour, Isaac Bayley. Some resemblances betwixt Plants and Animals in respect of their nutrition, etc. Glasgow, 1879. 8vo.

—— The Dragon's Blood Tree of Socotra (*Dracæna Cinnabari*, Balf. fil.) (Trans. Roy. Soc. Edinb. xxx.) Edinburgh [1883.] 4to.

Ball, Carleton R. Grasses of Iowa. See **Iowa.** § 3. 1904.

Barbaro, Ermolao. In C. PLINII naturalis historiæ libros castigationes. Basileæ, 1534. sm. 4to.

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Bartholomaeus, *Anglicus.* (Erroneously called **Bartholomew de Glanville**). BERTHOLOMEUS. De proprietatibus rerum. Londini, 1535. sm. fol.

Battandier, Jules Aimé, & Louis Trabut. Flore analytique et synoptique de l' Algérie et de la Tunisie. Alger, 1904. 8vo.

(1902 is the year given on the title-page, but 1904, which occurs twice on the wrapper, appears to be correct.)

Beal, William James. The new Botany. A lecture on the best method of teaching. (Trans. Mich. State Teachers' Assoc. 29th meeting.) [Lansing, s.a.] 8vo.

Bennett, Alfred William. How flowers are fertilised. (Science Lectures for the People.) Manchester, (1873.) 8vo.

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ROYAL BOTANIC GARDENS, KEW.

BULLETIN

OF

MISCELLANEOUS INFORMATION.

APPENDIX III.—1906.

NEW GARDEN PLANTS OF THE YEAR 1905.

The number of garden plants annually described in botanical and horticultural publications, both English and foreign, is now so considerable that it has been thought desirable to publish a complete list of them in the *Kew Bulletin* each year. The following list comprises all the new introductions recorded during 1905. These lists are indispensable to the maintenance of a correct nomenclature, especially in the smaller botanical establishments in correspondence with Kew, which are, as a rule, only scantily provided with horticultural periodicals. Such a list will also afford information respecting new plants under cultivation at this establishment, many of which will be distributed from it in the regular course of exchange with other botanic gardens.

The present list includes not only plants brought into cultivation for the first time during 1905, but the most noteworthy of those which have been re-introduced after being lost from cultivation. Other plants included in the list may have been in gardens for several years, but either were not described or their names had not been authenticated until recently.

In addition to species and well-marked varieties, hybrids, whether introduced or of garden origin, have been included where they have been described with formal botanical names. Mere cultural forms of well-known garden plants are omitted, for obvious reasons.

In every case the plant is cited under its published name, although some of the names are doubtfully correct. Where, however, a correction has appeared desirable, this is made.

The name of the person in whose collection the plant was first noticed or described is given where known.

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An asterisk is prefixed to all those plants of which examples are in cultivation at Kew.

The publications from which this list is compiled, with the abbreviations used to indicate them, are as follows :—*B. M.*—Botanical Magazine. *Bull Cat.*—W. Bull & Sons' Catalogue of Plants. *B. M. H. N.*—Bulletin du Muséum d'Histoire Naturelle, Paris. *B. N. Y. B. G.*—Bulletin of the New York Botanical Garden. *B. S. B. F.*—Bulletin de la Société Botanique de France. *B. T. O.*—Bullettino della R. Società Toscana di Orticultura. *Gard.*—The Garden. *G. C.*—Gardeners' Chronicle. *Gfl.*—Gartenflora. *G. M.*—Gardeners' Magazine. *G. W.*—Gardening World. *Gartenwelt*—Die Gartenwelt. *I. S. H. T.*—Icones Selectæ Horti Thenensis. *Jard.*—Le Jardin. *J. of H.*—Journal of Horticulture. *J. H. F.*—Journal de la Société Nationale d'Horticulture de France. *J. R. H. S.*—Journal of the Royal Horticultural Society. *Lemoine Cat.*—Lemoine Catalogue. *M. D. G.*—Mitteilungen der Deutschen Dendrologischen Gesellschaft. *M. K.*—Monatsschrift für Kakteenkunde. *N. B.*—Notizblatt des Königl. botanischen Gartens und Museums zu Berlin. *O. R.*—Orchid Review. *R. H.*—Revue Horticole. *R. H. B.*—Revue de l'Horticulture Belge. *Späth Cat.*—L. Späth, General Nursery Catalogue. *T. & S.*—Trees and Shrubs, C. S. Sargent. *Veitch Cat.*—J. Veitch & Sons' Catalogue of Plants. *Vilm. Cat.*—Vilmorin Andrieux & Cie. Catalogue. *W. G.*—Wiener Illustrirte Garten-Zeitung.

The abbreviations in the descriptions of the plants are :—*diam.*—Diameter. *ft.*—Foot or Feet. *G.*—Greenhouse. *H.*—Hardy. *H. H.*—Half-hardy. *in.*—Inches. *S.*—Stove.

***Acacia linearis.** (*B. M.* t. 2156; *R. H. B.* 1905, 117.) Leguminosæ. G. A tender shrub of erect habit. Phyllodia linear, upwards of 6 in. long. Flowers small, sessile, pale yellow, borne in straight spikes. Australia. (Dr. J. de Cock, Belgium.)

***Acanthus Perringi.** (*G. C.* 1905, xxxvii. 2; *Gartenwelt*, ix. 354.) Acanthaceæ. H. A handsome species, from 1 to 1½ ft. high, bearing spikes of rosy-red flowers and greyish-green sessile leaves. Cappadocian Anti-Taurus. (W. Siehe, Mersina, Asia Minor.)

***Acer colchicum aureum.** (*G. C.* 1901, xxix. 374.) Sapindaceæ. H. A form with golden bronzy leaves. Leaf stalks and young bark crimson. (T. Cripps & Son.) [*A. pictum aureum.*]

Acer laetum, var. tricaudatum. (*J. R. H. S.* xxix. 354, f.) Sapindaceæ. H. A new form with acutely pointed 3-5-lobed leaves. China. (J. Veitch & Sons.)

Acer laevigatum Fargesii (*J. R. H. S.* xxix. 353, f.) H. or or H.H. A dwarf variety of slow growth; the young leaves and fruits are coloured bright crimson. China. (J. Veitch & Sons.)

Acer Pseudoplatanus, var. brilliantissima. (*Gard.* 1905, lxvii. 318.) H. A variegated small-leaved form of compact growth.

Acer sinense, var. concolor. (*J. R. H. S.* xxix. 348, f.) H. A form with 5-lobed pointed leaves, reddish when young, changing to bright green. China. (J. Veitch & Sons.)

Acer sutchuenense. (*J. R. H. S.* xxix. 353, f.) H. A species with globular heads of flowers and 3-lobed leaves. China. (J. Veitch & Sons.)

Acer tetramerum lobulatum. (*J. R. H. S.* xxix. 353, f.) H. A small-leaved form of graceful appearance, with Birch-like leaves. China. (J. Veitch & Sons.)

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***Æchmea lavandulacea.** (*B. M.* t. 8005.) Bromeliaceæ. S. Plant about 18 in. high, of very distinct appearance. Leaves 18 in. long by 1¼ in. wide, ligulate, with horny red margins. Flowers in a distichous panicle; sepals green; petals deep violet, on a rose-coloured scape about 14 in long. W. Indies. (Kew.)

Agapanthus umbellatus globosus. (*G. C.* 1905, xxxviii. 237, f., 459.) Liliaceæ. H.H. A form with deciduous leaves and globular heads of flowers. Orange River Colony. (W. Bull & Sons.)

Aloe campylosiphon. (*N. B.* iv. 151.) Liliaceæ. S. Leaves lanceolate, recurved, about 15 in a rosette, 5 in. long and about 2 in. broad at the base, armed with small spines, glaucous green with whitish markings. Scape 12 in. high, slender, with pale yellow flowers. East Tropical Africa. (Berlin B.G.; Sir T. Hanbury, La Mortola.)

Aloe Chabaudii. (*G. C.* 1905, xxxviii. 102, f.) S. A new species from the Zambesi. Leaves glaucous, up to 19 in. in length and 6 in. in breadth at the base, bordered with small prickles. Flowers in loose panicles 24–30 in. high; outer segments pale brick-red with whitish wings at the apex. Allied to *A. stricta*, Haw. Trop. Africa. (J. A. Chabaud, Port Elisabeth.)

***Aloe decora.** (*G. C.* 1905, xxxviii. 385, f.) G. A dwarf species having dense rosettes of ovate-lanceolate leaves, 8 in. in length, and 3–4 in. broad at the base. Flowers in a dense raceme, red, tipped with green, becoming paler with age. South Africa. (S. Schönland, Grahamstown.)

***Aloe Orpensæ.** (*G. C.* 1905, xxxviii. 385, f.) G. Leaves up to 12 in. in length, oblong-lanceolate, convex and lined with white spots and markings on both surfaces. Flowering-stems 2 ft. high; perianth an inch long, red, tipped with white. South Africa. (S. Schönland, Grahamstown.)

Alpinia borneensis. (*B. S. B. F.* 1904, 448.) Scitamineæ. S. A very distinct species, 4–6 ft. high. Leaves up to 2 ft. in length. Flowers in panicles 12 in. long, purple-lipped, succeeded by large fruits. Borneo. (Buitenzorg B. G.)

Alpinia fimbriata. (*B. S. B. F.* 1904, 447.) S. Stems 3–5 ft. high. Leaves lanceolate, about 18 in. long by 1½ in. broad, on short petioles. Flowers purple, in handsome spikes. (Buitenzorg B. G.)

Altamiranoa spp. (*B. N. Y. B. G.* iii. 32.) A new genus of Crassulaceæ. *A. scopulina* is in cultivation in the Washington B. G.

Amomum platyandrum. (*B. S. B. F.* 1904, 451.) Scitamineæ. S. A perennial herb with stems 6–8 ft. high, bearing ovate-lanceolate leaves 2½ ft. long by 5 in. broad, on short petioles. Flowers in spikes, dark red with a yellow lip. (Buitenzorg B. G.)

Amomum trilobum. *B. S. B. F.* 1904, 453.) S. Stems 2–3 ft. high. Leaves 9 in. long. Flowers in small heads with yellowish-white bracts. French Indo-China. (Paris B. G.)

***Arabis Ferdinandi-Coburgi.** (*G. C.* 1905, xxxvii. 35.) Cruciferæ. H. Forms small rosettes of greyish leaves, green in winter. Flowers small, yellowish white. Macedonia. (S. Arnott.)

Arachnanthe annamensis. (*G. C.* 1905, xxxvii. 391.) Orchidaceæ. S. A stout erect plant about 18 in. high, with bright green coriaceous leaves. Inflorescence over a foot in length, bearing yellow flowers heavily barred with reddish brown. Similar to *A. moschifera*, but differs in the lip and in its much longer leaves. Annam. (Glasnevin B. G.)

Aralia mandschurica fol. aureo-variegata. (*Veitch Cat.* 1905, 36.) Araliaceæ. A form with golden-yellow variegated leaves. (J. Veitch & Sons.) [*A. chinensis*, var.]

***Aralia triloba.** (*Bull Cat.* 1905.) S. A tall species of slender growth. Leaves alternate, trifoliate, 1½ ft. long, dark green. New Caledonia. (W. Bull & Sons.) Introduced in 1896, distributed in 1905. [See *G. C.* 1896, xx. 309.]

***Asparagus madagascariensis.** (*B. M.* t. 8046.) Liliaceæ. S. An erect shrub with numerous slender ridged branches, the leaves forming short recurved spurs. Phylloclades ternate, ½ in. long. Flowers yellowish,

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produced in threes at the ends of the branchlets, succeeded by bright crimson 3-lobed berries. Madagascar. (Paris B. G.; Kew.)

***Aspilia buphthaimifolia.** (*G. C.* 1905, xxxviii. 404.) Compositæ. H. A bushy annual, about 18 in. high, with rough hairy stems. Leaves lanceolate, irregularly toothed. Flowers deep golden-yellow, resembling those of *Heliopsis lævis*. Argentine Region. (Kew.)

Astilbe grandis. (*G. C.* 1905, xxxviii. 74, 426, f.) Saxifragaceæ. A new species resembling *A. Davidii* in general appearance. Radical leaves from 2–3 ft. in length, bipinnate or tripinnate; cauline leaves similarly shaped but smaller. The hairy flowering stems attain a height of 6 ft. Flowers pure white, densely crowded on the pubescent lateral branches of the panicle, which is from 2–2½ ft. long. China. (J. Veitch & Sons.)

Aubretia Moerheimi. (*Lem. Cat.* 1905, 7.) Cruciferæ. H. Has large rosy-pink flowers. (V. Lemoine et Fils, Nancy, France.) [*A. deltoidea*, var.]

Aubretia Perkinsii. (*Gard.* 1905, lxvii. 344.) H. A variety with deep purple white-centred flowers. (F. Perkins, Stratford-on-Avon.) [*A. deltoidea*, var.]

Begonia Alleryi. (*R. H. B.* 1905, 271.) Begoniaceæ. G. Described as a cross between *B. metallica* and *B. gigantea*. (A. Aubert, Tours, France.)

Begonia gigantea. (*R. H. B.* 1905, 271.) G. Rootstock woody; stem 2–3 ft. high. Leaves caudate-acuminate, up to 12 in. long. Flowers numerous, small, white or pale pink. Himalaya.

Begonia longicyma. (*R. H.* 1905, 137, f., 582, f.) G. A garden hybrid between *B. schmidtiana* and *B. semperflorens*. (G. Bellair.)

Begonia ricinifolia gigantea odorata. (*Gfl.* 1905, 42, f.) G. A garden hybrid between *B. ricinifolia* and *B. fulgens* × *scharffiana*. (Franz Ament, Saalfeld, Germany.)

Berberis vulgaris macrophylla. (*G. C.* 1905, xxxviii. 115.) Berberidaceæ. H. A large-leaved form. (Paul & Son, Cheshunt.)

Betonica spicata robusta. (*G. C.* 1905, xxxviii. 55; *Gard.* 1905, lxviii. 61, f.; *G. M.* 1905, 468, f.) Labiatæ. H. A good form of the type, with pink flowers. (A. Perry.) [*Stachys grandiflora*, var.]

Betula Bhojpatra glandulifera. (*Späth Cat.* 1905–6, 80.) Betulaceæ. H. Near *B. Ermani* and *B. ulmifolia*. Branches thickly covered with glands. Leaves triangular, acuminate. Origin not stated. (L. Späth, Berlin.)

Betula humilis × pubescens. (*Späth Cat.* 1905–6, 80.) H. Of moderately vigorous growth and densely branching habit, with dark coloured bark, and rhomboid shining dark green leaves. (L. Späth, Berlin.)

***Blakea gracilis.** (*Jard.* 1905, 290.) Melastomaceæ. S. A shrub of compact growth, 2–3 ft. high. Flowers white and pink, fragrant. Tropical America. (V. Lemoine et Fils, Nancy.)

Bomarea edulis Elwesii. (*G. C.* 1905, xxxvii. 350.) Amaryllidaceæ. G. A form with pink outer segments, the inner ones pencilled with red. (H. J. Elwes.)

***Bonatea antennifera.** (*G. C.* 1905, xxxviii. 451.) Orchidaceæ. G. Leaves oblong, 3–6 in. long. Flowers numerous, green and white, borne in lax racemes 9 in. long. Bracts lanceolate, acuminate, 1–2 in. long. Petals 2 in. long, deeply bipartite; lip tripartite, side lobes 2 in. long. Rhodesia. (Kew.)

Bougainvillea formosa. (*Bull Cat.* 1905, 5.) Nyctaginaceæ. S. or G. Of free growth and semi-scandent habit, with bright purplish-mauve bracts. Brazil. (W. Bull & Sons.)

***Bowkeria gerrardiana.** (*B. M.* t. 8021.) Scrophulariaceæ. G. or H. H. An erect growing shrub 8 or 10 ft. high. Flowers in axillary cymes, white, red-dotted inside, with a viscid exterior. Leaves sessile, elliptic or oblong-lanceolate, from 2–6 in. long. S. Africa. (Lord Walsingham; Kew.)

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Brasso-Cattleya laurentiano-glauca. (*R. H. B.* 1905, 72.) Orchidaceæ. G. A light rose-coloured form, with a white base to the lip. (F. Lambeau, Brussels.)

Brasso-Cattleya nivalis. (*G. C.* 1905, xxxvii. 268; *J. of H.* 1905, 1., 485, f.) G. A garden hybrid between *B. fragrans* and *C. intermedia.* (Sir T. Lawrence.)

Brasso-Cattleya Peetersii. (*O. R.* 1905, 119.) S. A garden hybrid between *Brassavola glauca* and *Cattleya lawrenceana.* (A. A. Peeters, Brussels.)

Brasso-Cattleya Sanderi. (*O. R.* 1905, 23, 49, f.) G. A garden hybrid between *Cattleya Schrœderæ* and *Brassavola glauca.* (F. Sander & Sons.)

Buddleia nivea. (*G. C.* 1905, xxxviii. 275, f.) Loganiaceæ. H. A shrub of medium growth, with a white woolly pubescence covering the under surface of the leaves and flowering stems. Leaves ovate-lanceolate, glabrous above except the midrib, coarsely toothed, up to 9 in. in length and 4 in breadth; flowers lilac or purple, densely crowded on the terminal panicle. China. (J. Veitch & Sons.)

Buddleia variabilis magnifica. (*G. C.* 1905, xxxviii. 115.) H. A robust form with reddish-lilac flowers. (J. Veitch & Sons.)

Bulbophyllum crenulatum. (*B. M.* t. 8000.) Orchidaceæ. S. Closely allied to *B. robustum.* Pseudobulbs 1½ in. long, 1 in. broad, quadrangular, borne on stout woody rhizomes. Leaves in pairs, 2 to 3 in. long, elliptical-oblong, coriaceous. The racemes of small inconspicuous purplish flowers are carried on stout suberect scapes 6 in. high. Madagascar. (Glasnevin B. G.)

***Bulbophyllum quadrifarium.** (*G. C.* 1905, xxxviii. 57; *O. R.* 1905, 244.) A new species, with inconspicuous flowers. Madagascar. (Glasnevin B. G.)

Bulbophyllum radiatum. (*G. C.* 1905, xxxvii. 398.) S. Pseudobulbs 1 in. long, conical, thickly set on a stout rhizome. Leaf linear, obtuse. Scape slender, 2 to 3 in. long. Flowers yellowish-white, with narrowly lanceolate sepals and petals. India. (Sir T. Lawrence.)

***Cadalvena spectabilis.** (*B. M.* t. 7992.) Scitamineæ. S. A *Maranta*-like plant with fleshy green rotund leaves, 9 in. across, and large golden yellow subsessile flowers. Tropical Africa. (Kew.)

Calanthe Chapmani. (*G. C.* 1905, xxxvii. 61; *G. M.* 1905, 87, f.) Orchidaceæ. S. A garden hybrid between *C. burfordiense* and *C.* "*Oakwood Ruby.*" (N. C. Cookson.)

***Campanula phyctidocalyx.** (*G. W.* 1905, 464.) Campanulaceæ. H or H.H. Resembles *C. Rapunculus* in habit of growth. Flowers dark blue, with black styles, from 10 to 12 in a raceme, somewhat like those of *C. persicifolia.* Leaves lanceolate or cordate, bright green. Armenia. (Sir T. Lawrence.)

Catasetum macrocarpum, var. rubrum. (*R. H. B.* 1905, 264.) Orchidaceæ. S. A red-flowered form of the type. (F. Lambeau, Brussels.)

Cattleya Appletoni. (*O. R.* 1905, 350.) Orchidaceæ. S. A garden hybrid between *C. elongata* and *C. dowiana aurea.* (W. M. Appleton.)

Cattleya aurea, vars. Duchesnei, linthoutiana and roseta. (*R. H. B.* 1905, 263.) S. Forms differing slightly from the type. (F. Lambeau, Brussels.)

Cattleya aurea Leopoldi. (*R. H. B.* 1905, 236.) S. A form with dark rose-coloured lip. (Marquis de Wavrin, Château de Ronsele, Belgium.)

Cattleya bowringiana × Lælio-Cattleya elegans Turneri. (*R. H. B.* 1905, 263.) S. Of garden origin. (F. Lambeau, Brussels.)

Cattleya bowringiana × schilleriana. (*R. H. B.* 1905, 239.) S. A garden hybrid between the species indicated. (F. Lambeau, Brussels.)

Cattleya Gigas pallida. (*R. H. B.* 1905, 273.) G. A fine form with very broad petals and sepals and a purple lip. (Marquis de Wavrin, Château de Ronsele, Belgium.) [*C. Warscewiczii pallida.*]

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Cattleya labiata splendens. (*G. C.* 1905, xxxvii. 53.) G. A very large and finely coloured form. (Glasnevin B. G.)

Cattleya lawreglossa. (*O. R.* 1905, 119.) S. A garden hybrid between *C. amethystoglossa* and *C. lawrenceana*. (J. Chamberlain.)

Cattleya Mendeli Pittiæ. (*G. C.* 1905, xxxvii. 398.) G. A form having nearly white sepals and petals; the front lobe of the lip is marked with pink. (H. T. Pitt.)

Cattleya mirabilis. (*R. H. B.* 1905, 212.) G. A garden hybrid between *C. Warscewiczii* and *C. Patrocini*. (F. Lambeau, Brussels.)

Cattleya pittiana aurea. (*R. H. B.* 1905, 236.) S. A garden hybrid between *C. schofieldiana* and *C. aurea*. (F. Lambeau, Brussels.)

Cattleya Pittiæ. (*G. C.* 1905, xxxvii. 333; *G. M.* 1905, 517, f.) A garden hybrid between *C. harrisoniana* and *C. schilleriana*. (H. T. Pitt.)

Cattleya schilleriana × Gigas. (*R. H. B.* 1905, 211.) G. Of garden origin. (M. de Bièvre, Laeken, Brussels.)

Cattleya Trianæ boetzelaeriensis. (*R. H. B.* 1905, 71.) G. A rose-coloured form, delicately shaded. (Duchesne & Lanthoine, Watermael, Belgium.)

Cattleya Trianæ tessellata. (*R. H. B.* 1905, 95.) G. A large rose-coloured form, curiously marked. (Marquis de Wavrin, Château de Ronsele, Belgium.)

Ceratolobus concolor. (*R. H. B.* 1905, 274.) Palmæ. S. "Probably the only plant of this species in cultivation." Dutch E. Indies. (M. Wartel, Belgium.)

Cereus Moennighoffii. (*M. K.* 1905, 143.) Cactaceæ. S. A hybrid between *C. flagelliformis* and *C. martianus*. (Halle B. G.)

Cereus ruber. (*M. K.* 1905, 22, f.) S. Resembles *C. aggregatus*. Main stems triangular, others many-angled; the young growths carmine-red, passing into green. Spines in tufts of five, surrounded by bristles. Flowers orange-yellow passing into scarlet, from 2–4 in. across. Brazil. (H. Quehl, Vitzenburg; Bonn B. G., Germany.)

Cereus urbanianus. (*M. K.* 1905, 43; *N. B.* iv. 158.) S. Stems branched, from ½–2 in. thick, 4–6 angled, with a few strong aerial roots. Spines in tufts of 3–6, yellow, up to ¼ in. long. Flowers reddish-brown tipped with red, pale yellow inside, with a strong Vanilla-like scent. Haiti. (Berlin B. G.)

***Cirrhopetalum breviscapum.** (*B. M.* t. 8033.) Orchidaceæ. S. An epiphyte with sheathed creeping rhizomes. Bulbs about ¾ in. long, tetragonal, bearing single leaves. Flowers borne singly on short scapes; dorsal sepal and petals dull purple; lateral sepals yellow marked with brown; lip rosy purple, broadly cordate at the base. Malaya. (Glasnevin B. G.; Kew.)

Codiæum edmontonense. (*G. C.* 1905, xxxviii. 55.) Euphorbiaceæ. S. A good narrow-leaved form, brilliantly coloured. (H. B. May.)

***Cœlogyne lawrenceana.** (*G. C.* 1905, xxxvii. 205, 227; *G. M.* 1905, 254, f.) Orchidaceæ. S. A new large-flowered species allied to *C. pittacina*. Leaves broad, lanceolate. Flowers light buff-yellow; petals narrow, tinged with brown; lip bright yellow with a cream-coloured front lobe. Annam. (Sir T. Lawrence.)

Cœlogyne speciosa alba. (*G. C.* 1905, xxxvii. 205; *G. M.* 1905, 226, f.) A light-coloured form having yellowish sepals and petals; lip white with a salmon-coloured base. (F. Sander & Sons.)

Coffea canephora, var. kwiluensis, C. congensi ubangiensis, C. Dewevrei, C. Dybowski, C. Humbloti, C. Laurentii. (*R. H. B.* 1905, 278.) Rubiaceæ. S. Described as indigenous species cultivated in the Congo. (Brussels B. G.)

***Colchicum Steveni.** (*B. M.* t. 8025.) Liliaceæ. H. or H. H. A beautiful species producing fascicles of from 3 to 10 pale rosy-lilac flowers. Leaves linear, appearing at the time of flowering. Syria & Arabia. (Kew.)

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***Coleus shirensis.** (*B. M.* t. 8024.) Labiatæ. G. Forms a bush about 3 ft. high, in the way of *C. thyrsoideus*. Stems angular, at first pale green, passing to brown. Leaves glandular and hairy, ovate, acute, subcordate at the base; petioles up to 2½ in. long. Flowers dark blue, in large erect terminal panicles. British Central Africa. (Kew.)

Cotoneaster pannosa. (*G. C.* 1905, xxxvii. 60; *Gard.* 1905, lxvii. 118, f.) Rosaceæ. H. A handsome species of slender growth, 4–6 ft. high. Leaves ovate-oblong, the lower surface tomentose. Flowers white, numerous, in dense clusters on the axillary growths, followed by bright red berries. China. (J. Veitch & Sons.)

***Cotyledon elegans.** (*B. M.* t. 7993.) Crassulaceæ. G. A handsome new species distinguished by its pubescent character and large bright red flowers, yellow inside. Leaves in small terminal rosettes, sessile, the tips tinged with red. Mexico. (Kew.)

***Cotyledon insignis.** (*B. M.* t. 8036.) G. Distinct from all other known species. About 2 ft. high, and entirely glabrous. Stems erect, light green, with broad opposite leaves up to 5 in. long. Flowers in terminal and axillary cymes. Corolla-tube about 1½ in. long, light red; lobes greenish-yellow inside. British Central Africa. (Kew.)

***Cratægus spp.** (*Späth Cat.* 1905–6, 90.) Rosaceæ. H. The following North American species are now in cultivation: — *acutiloba*, *anomala*, *aprica*, *arkansana*, *arnoldiana*, *canadensis*, *Canbyi*, *coccinioides*, *collina*, *compta*, *Crus-galli oblongata*, *diffusa*, *durobrivensis*, *Egglestoni*, *ellwangeriana*, *fecunda*, *fertilis*, *integriloba*, *Laneyi*, *nitida*, *peoriensis*, *persimilis*, *pratensis*, *Pringlei*, *submollis*, *suborbiculata*.

***Cyananthus Hookeri, var. hispida.** (*G. C.* 1905, xxxviii. 434.) Campanulaceæ. H. An annual with small petiolate leaves and blue flowers. China. (Kew.) [Syn. *C. micranthus*.]

***Cyananthus incanus, var. leiocalyx.** (*G. C.* 1905, xxxviii. 434.) H. The Chinese form, differing in the less hairy calyx. Flowers yellow, campanulate, borne on numerous wiry stems. Leaves small, nearly entire. West China & Tibet. (J. Veitch & Sons.) [Syn. *C. yunnanensis*.]

***Cyananthus linifolius.** (*G. C.* 1905, xxxviii. 434.) H. A slender wiry-stemmed plant with small entire leaves. Flowers resembling those of *C. lobatus*, with a very hairy throat and longer narrower segments. Himalaya. (Kew.)

Cyathea canaliculata, var. Congi. (*R. H. B.* 1905, 240.) Filices. S. Name only. Congo. (Brussels B. G.)

***Cycas Micholitzii.** (*G. C.* 1905, xxxviii. 62, 142 f.; *Gartenwelt*, 1905, x. 3, f.) Cycadaceæ. S. A new species with subterranean stem, remarkable for the repeated dichotomy of the leaf-pinnules. Leaves up to 10 ft. in length, the lower portion armed with prickles; pinnules 8 in. long, ¼ in. broad. Nepal to Cochin China. (F. Sander & Sons.)

Cymbidium erythrostylum. (*G. C.* 1905, xxxviii. 427.) Orchidaceæ. S. A new species of graceful habit, allied to *C. Parishii* and *C. eburneum*. Pseudo-bulbs ovate-oblong, carrying several leaves 10–15 in. long and ½ in. broad, sheathed at the base. Flower-scapes a foot in length; flowers white, the lower half of the petals and 3-lobed lip marked with purple. Column very conspicuous, bright crimson. Annam. (Glasnevin B. G.)

***Cymbidium Sanderi.** (*G. C.* 1905, xxxvii. 108, 115, f.) S. A very distinct species of vigorous growth. Flowers 3½ in. across, shading from white to rosy-red; the large white lip thickly spotted with rose-purple. Cochin China. (F. Sander & Sons.)

Cymbidium Schroederi. (*G. C.* 1905, xxxvii. 243.) S. Petals and sepals lanceolate, green, lined and dotted with reddish brown. Lip light yellow, striped with brown. Allied to *C. giganteum*. Annam. (Baron Schröder.)

Cypripedium argo-mastersianum. (*G. C.* 1905, xxxvii. 245.) Orchidaceæ. S. A garden hybrid between *C. Argus* and *C. mastersianum*. (Rev. A. H. Upcher.) [*Paphiopedilum*.]

***Cypripedium debile.** (*G. C.* 1905 xxxviii. 442, f.) H. H. A curious species with greenish flowers, m[illegible]

with purple. Leaves similar to those of the British *Listera ovata*. Japan. (L. Boehmer & Co., Yokohama.)

Cypripedium elmirianum. (*G. C.* 1905, xxxviii. 414; *R. H. B.* 1905, 41, 277.) A garden hybrid between *C. Charlesworthii* and *C. insigne Sanderæ*. [*Paphiopedilum.*]

***Cypripedium gratrixianum.** (*G. C.* 1905, xxxvii. 60, 77, f.) A new species allied to *C. insigne* and *C. Exul*, from which it differs in habit, and its broad leathery leaves, 8 in. in length. (F. Sander & Sons.) [*Paphiopedilum.*]

Cypripedium haywoodianum. (*G. C.* 1905, xxxvii. 174, 195, f.) A garden hybrid between *C.* "*T. B. Haywood*" and *C. bellatulum*. (Mrs. Haywood.) [*Paphiopedilum.*]

Cypripedium Honnoriæ. (*G. C.* 1905, xxxvii. 108; *G. M.* 1905, 133, f.) A garden hybrid between *C. Drurii* and *C. Godefroyæ leucochilum*. (W. M. Appleton.) [*Paphiopedilum.*]

Cypripedium Janssensi. (*R. H. B.* 1905, 47.) G. A garden hybrid between *C. spicerianum* and *C. villosum aureum*. (Janssens & Putzeys, Merxem, Antwerp.) [*Paphiopedilum.*]

Cypripedium Leoniæ var. **Cravenieæ.** (*G. C.* 1905, xxxvii. 108; *O. R.* 1905, 153, f.) G. A garden hybrid between *C. callosum* and *C. insigne*, Harefield Hall var. (J. F. Craven.) [*Paphiopedilum.*]

Cypripedium Lowii × bellum (*bellatulum ?*). (*R. H. B.* 1905, 167.) S. A garden hybrid between the species indicated. (F. Lambeau, Brussels.) [*Paphiopedilum.*]

Cypripedium madiotianum. (*R. H. B.* 1905, 96.) G. A garden hybrid between *C. villosum* and *C. chamberlainianum*. (F. Lambeau, Brussels.) [*Paphiopedilum.*]

Cypripedium Memoria-Jerninghamiæ. (*G. C.* 1905, xxxvii. 15; *G. W.* 1905, 69, f.) A garden hybrid of unknown parentage. (F. Wellesley.)

Cypripedium Memoria-Lubbersii (*R. H. B.* 1905, 71, 214.) S. A garden hybrid between *C. lawrenceanum* and *C. barbatum nigrum*. (Duchesne & Lanthoine, Watermael, Belgium.) [*Paphiopedilum.*]

Cypripedium Putzeysi. (*R. H. B.* 1905, 22.) G. A garden hybrid between *C. albertianum* and *C. insigne silhetense*. (F. Lambeau, Brussels.) [*Paphiopedilum.*]

Cypripedium Robsoni. (*G. C.* 1905, xxxvii. 174.) G. "A supposed hybrid between *C. insigne Sanderæ* and *C. Exul*." (E. Bostock.) [*Paphiopedilum.*]

Cypripedium San-Actæus. (*G. C.* 1905, xxxvii. 61; *G. M.* 1905, 821, f.) G. A garden hybrid between *C. insigne Sanderæ* and *C. Actæus*. [*Paphiopedilum.*]

Cypripedium tessellatum rubens. (*G. C.* 1905, xxxviii. 447.) S. A garden hybrid between *C. concolor* and *C. barbatum grandiflorum*. (F. Sander & Sons.) [*Paphiopedilum.*]

Cypripedium tibeticum. (*O. R.* 1905, 194.) H. Allied to *C. macranthum*. A handsome species with large blackish-purple and green pouch and greenish-yellow dorsal sepal and petals, reticulated with dark lines, the latter strongly pilose on the lower half. Eastern Tibet & China. (J. Veitch & Sons.)

Cypripedium tresillianum. (*R. H. B.* 1905, 22.) G. A garden hybrid between *C. insigne* and *C. bellatulum*. (F. Lambeau, Brussels.) [*Paphiopedilum.*]

Cypripedium villoso-rothschildianum. (*G. C.* 1905, xxxviii. 218.) S. A garden hybrid between the species indicated. (N. C. Cookson.) [*Paphiopedilum.*]

Cyrtanthus inæqualis. (*G. C.* 1905, xxxvii. 261, f.) Amaryllidaceæ. G. A new species, distinguished by the erect habit of the coral-red flowers, borne in umbels on scapes 1 ft. high, and the overhanging upper segments of the perianth. Leaves linear, 1 ft. or more in length, narrowing at the base. Cape Colony. (W. Cutbush & Son.)

Cyrtanthus sanguineus glaucophyllus. (*G. C.* 1905, xxxviii. 253.) G. A form with somewhat glaucous foliage and orange-red flowers. (J. O'Brien.)

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Cytisus Hillebrandtii. (*I. S. H. T.* 1905, 73, f.) Leguminosæ. G. A suffruticose species with long slender hairy stems and trifoliate hairy leaves. Flowers borne at the tops of the stems, axillary or terminal, yellow. Canary Is. (C. Sprenger, Naples.)

Dendrobium chessingtonense. (*G. C.* 1905, xxxvii. 174; *O. R.* 1905, 101). Orchidaceæ. G. A garden hybrid between *D. aureum* and *D. Wiganiæ*. (R. G. Thwaites.)

Dendrobium ciliatum annamense. (*G. C.* 1905, xxxviii. 115; *O. R.* 1905, 274.) S. A white-flowered form with fringed lip, purple at the base. Annam. (Sir T. Lawrence.)

Dendrobium Elwesii. (*G. C.* 1905, xxxvii. 174.) S. A garden hybrid between *D. Hildebrandtii* and *D. aureum*. (H. J. Elwes.)

Dendrobium Haywoodiæ. (*G. C.* 1905, xxxvii. 205.) S. A garden hybrid between *D. splendidissimum* and *D. findlayanum*. (Mrs. Haywood.)

Dendrobium lichenastrum. (*O. R.* 1905, 142.) S. Very similar to *D. linguiforme* in habit of growth. A very small species, barely an inch high, with stout creeping rhizomes and short fleshy leaves. Flowers 4 lines long, with yellowish-white sepals and petals, lined with purple; lip purple at the base. Queensland. (Sir Chas. Strickland.) [Syn. *Bulbophyllum lichenastrum*.]

Dendrobium Mortii. (*O. R.* 1905, 90.) S. A very remarkable species somewhat resembling *D. teretifolia*. Stems up to 4 ft. long, branching into slender growths on which the leaves are reduced from 5 inches to about half an inch in length. Flowers solitary, 1 in. long; sepals and petals light yellow; lip acuminate, whitish, marked with lilac, with three undulate green keels on the disc; the segments and chin are marked with purple. New South Wales. (Glasnevin B. G.)

Dendrobium Phalænopsis thundersleyense. (*G. C.* 1905, xxxviii. 348.) S. A dark-coloured form. (H. Low & Co.)

Dendrobium roseo-nervatum. (*N. B.* iv. 131.) S. Stems erect, up to 8 in. high. Leaves lanceolate, acute, barely 1 in. long. Flowers borne at the summits of the stems, pale rose. Allied to *D. terminale*. Sumatra. (Berlin B. G.)

Dendrobium striatum. (*G. C.* 1905, xxxviii. 382; *O. R.* 1905, 366.) S. "A very remarkable species..... Pseudobulbs a foot in length and closely set with pairs of singularly formed flowers, each an inch or more in width. Sepals and petals narrow and nearly equal; labellum as long as the petals, narrow, with the sides folded back, whitish tinged with rose." Philippines. (Sir T. Lawrence.) [This name, included in the List of 1892, was wrongly given to the garden hybrid *D.* "*Stratius*."]

***Derris alborubra.** (*B. M.* t. 8008.) Leguminosæ. S. A tropical evergreen shrub, of climbing habit, with stems upwards of 18 ft. long. Leaves pinnate, 6 or 7 in. long; petioles thickened at the base. Leaflets coriaceous, glabrous, obovate-oblong. Flowers fragrant, in long panicles; petals white; calyx red. Hong Kong. (Kew.)

Deutsia discolor var. **major.** (*Veitch Cat.* 1905, f.) Saxifragaceæ. H. A large-flowered form. Central China. (J. Veitch & Sons.)

Dia-Lælia Veitchii. (*O. R.* 1905, 115; *R. H.* 1905, 159.) Orchidaceæ. S. A bigeneric hybrid between *Diacrium bicornutum* and *Lælia cinnabarina*. (J. Veitch & Sons.)

Diervilla rivularis. (*G. C.* 1905, xxxviii. 339, f; *Späth Cat.* 1905-6, 92.) Caprifoliaceæ. H. A handsome shrub with pubescent leaves. Flowers in large terminal panicles, pale yellow tinged with pink. Georgia, U.S.A. (W. E. Gumbleton.)

Dimorphotheca aurantiaca. (*G. C.* 1905, xxxviii. 127, f.) Compositæ. H. A showy perennial, about 9 in. high, glabrous, with linear-oblong thick leaves. Flowers like those of the Marigold, with a dark centre. South Africa. (Barr & Sons.) (Syn. *Calendula Tragus*, *B. M.* t 408.)

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Dorstenia psilurus. (*R. H. B.* 1905, 240.) Urticaceæ. S. Name only. Congo. (Brussels B. G.)

Dracæna americana. (*T. & S.* i. 207, t. 98.) Liliaceæ. S. Attains a height of 20–40 ft., the trunk up to 12 in. in diameter. Leaves linear-ensiform, from 8–15 in. long, green on both surfaces. Flowers white, small, in dense panicles. Allied to *D. Draco.* Central America. (New York B. G.)

Dracæna intermedia. (*R. H. B.* 1905, 240.) G. Described as a garden hybrid between *D. cannæfolia* (*Cordyline terminalis* var.) and *D. lineata.* (M. de Noyette, Ledeberg, Belgium.)

Dudleya spp. (*B. N. Y. B. G.* iii. 15–25.) Crassulaceæ. G. The following amongst others are stated to be new species :—*aloides, compacta, congesta, cultrata, Goldmani, Hallii, Parishii, rigida, robusta.* United States, &c. (New York & Washington B. G.)

Echeveria spp. (*B. N. Y. B. G.* iii. 5–10.) Crassulaceæ. G. The following species are described as new and in cultivation :—*cuspidata, maculata, Palmeri, platyphylla, pulvinata, subrigida.* United States, &c.

Echinocactus Arechavaletai. (*M. K.* 1905, 106, f.) Cactaceæ. G. Stem almost spherical, depressed and woolly at the top, 2–2½ in. in diameter, with 16–18 acute-angled ribs. Spines in numerous hairy tufts of 10 to 14, the central one about 1 in. long. Flowers yellow, 2 in. across. Uruguay. (Franz de Laet, Contich, Belgium.)

Echinocactus Fiebrigii. (*N. B.* iv. 183.) G. Stem globose, depressed, about 2 in. high and 2½ in. in diameter, with up to 18 angles, disposed spirally. Spines 30–40 in a tuft, white, the central ones nearly 1 in. long. Flowers rosy red, orange-red inside, 1½ in. long. Bolivia. (Berlin B. G.)

Echinocactus Mihanovichii. (*M. K.* 1905, 114, 142.) G. Stem greyish-green, up to 2 in. in diameter and somewhat less in height, 8-angled. Spines in tufts of 5 or 6, about ½ in. apart. Flowers about 1½ in. long, yellowish-green suffused with red. Paraguay. (Berlin B. G.)

Echinocactus peruvianus. (*M. K.* 1905, 190, f.) G. Plant about 3 in. high and 5 in. in diameter, dark bluish-green. Flowers numerous, rosy red, yellow outside, produced near the summit. Peruvian Andes. (Berlin B. G.)

***Eleutherococcus Henryi.** (*G. C.* 1905, xxxviii. 402, f.) Araliaceæ. H. A curious shrub, with rough brown prickly stems, up to 10 ft. high. Flowers small, greenish-white, crowded into terminal umbels, succeeded by black fruits. Leaves alternate, composed of 3 or 5 ovate-lanceolate leaflets, scabrid above, hairy beneath. China. (J. Veitch & Sons.)

Eleutherococcus leucorrhizus. (*G. C.* 1905, xxxviii. 404, f.) H. Smaller and of less vigorous growth than the preceding species, with fewer prickles. Stems bright green. Leaves membranous, hairy, carried on glabrous leaf stalks sometimes prickly beneath. Closely allied to *E. Henryi.* China. (J. Veitch & Sons.)

Epidendrum lambeauanum. (*R. H.* 1905, 335.) Orchidaceæ. S. A new species of slender growth, about 4 in. high. Flowers usually solitary, produced at the tops of the stems ; petals and sepals oblong or oblanceolate, greenish-white tinged with violet. Lip broad and convex, shining purple with a yellowish margin. Brazil. (F. Lambeau, Brussels.)

Epidendrum pterocarpum. (*G. C.* 1905, xxxvii. 398.) S. A plant of diminutive growth, chiefly of botanical interest. Mexico. (Sir T. Lawrence.)

Epidendrum radico-vitellinum. (*G. C.* 1905, xxxvii. 398.) S. A garden hybrid between the species indicated in the name. (Sir T. Lawrence.)

Epi-Lælia fletcheriana. (*G. C.* 1905, xxxvii. 60.) Orchidaceæ. G. A cross between *Epidendrum atropurpureum* and *Lælia harpophylla.* (F. Sander & Sons.)

Epi-Lælia vitell-brosa. (*G. C.* 1905, xxxvii. 398.) Orchidaceæ. S. A garden hybrid between *Epidendrum vitellinum* and *Lælia tenebrosa.* (Sir T. Lawrence.)

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Eremurus Bungei var. **præcox.** (*G. C.* 1905, xxxvii. 98.) Liliaceæ. H. An early-flowering variety of slender growth. The flowers are smaller and more loosely disposed on the spike than in the type. Baluchistan. (R. Wallace & Co.)

Eremurus Elwesii albus. (*G. C.* 1905, xxxvii. 349.) H. A white-flowered form of *E. robustus elwesianus*. (G. Reuthe.)

Eremurus isabellinus. (*J. H. F.* 1905, 456.) H. A garden hybrid between *E. Bungei* and *E. Olgæ*. (Ph. L. de Vilmorin, Verrières, France.)

Eria globifera. (*G. C.* 1905, xxxviii. 449.) Orchidaceæ. S. Allied to *E. leiophylla*, Lindl. A species with stout creeping rhizomes and small globose pseudobulbs, bearing single oblong leaves from 2–5 in. long. Flowers solitary, on slender scapes 1½–2 in. long, very downy on the outside, light yellow, the base of the segments marked with purple. Annam. (Glasnevin B. G.)

Erigeron glaucus semperflorens. (*R. H.* 1905, 96.) Compositæ. H. A dwarf floriferous form of the species. California. (Ph. L. de Vilmorin, Verrières, France.)

Eulophia paniculata. (*G. C.* 1905, xxxviii. 197.) Orchidaceæ, S. Pseudobulbs tufted, 3–5 in. long, bearing two strap-shaped leaves up to 19 in. in length, marbled on the upper surface. Flowers numerous, 1–1½ in. across, borne on a scape 5 ft. high; sepals dusky-brown; petals and lip yellowish-green, lined and netted with dull purple. Madagascar. (Glasnevin B. G.)

***Eulophia undulata.** (*G. C.* 1905, xxxviii. 198.) S. Pseudobulbs small, bearing tufts of linear-lanceolate slightly glaucous leaves up to 8 in. in length. Scape about a foot high, of slender growth; sepals spreading, purplish-brown; petals and lip pale green, the latter having three prominent keels on the disc. Rhodesia. (Kew.)

Eupatorium Purpusi. (*Lem. Cat.* 1905, 4.) Compositæ. G. "Flowers large and fragrant, pink, turning to white." (V. Lemoine et Fils, Nancy.)

Euphorbia multiceps. (*M. K.* 1905, 182. f.) Euphorbiaceæ. G. Allied to *E. tuberculata*, Jacq. South Africa. (Sir T. Hanbury, La Mortola.)

***Euphorbia Wulfeni.** (*G. C.* 1905, xxxvii. 301.) H. A vigorous species. Flowers in large clusters of greenish-yellow bracts. Leaves linear-oblong. Dalmatia. (A. Perry.)

Galanthus Elwesii vars. **Cassaba** and **globosus.** (*Gard.* 1905, lxvii. 70.) Amaryllidaceæ. H. These are wild forms of the species, differing slightly in flowers and leaves. Asia Minor.

Gentiana Lawrencei. (*G. C.* 1905, xxxviii. 307, f.) Gentianaceæ. H. A handsome perennial species with narrow arcuate leaves. Flowers upright, solitary, 1½ in. long, pale to darker blue above, with dark blue lines. Lake Baikal District. (Max Leichtlin, Baden-Baden.)

***Geranium grevilleanum.** (?) (*Gard.* 1905, lxviii. 140.) Geraniaceæ. H. A handsome species of bushy growth, with much divided leaves and numerous blue flowers 1½ in. across. Himalaya.

***Gerbera Elsæ.** (*G. C.* 1905, xxxviii. 5.) Compositæ. H. H. or G. A very handsome plant with fine bold flowers 2½ in. in diameter, carried on a scape 18 in. in height. Ligulate florets closely set, brilliant red; disc florets lighter red, with bright yellow anthers. Leaves 9 in. long, the margins and lower surface covered with a silvery tomentum. Origin not stated. (Max Leichtlin, Baden-Baden.)

Gleditschia inermis elegantissima. (*R. H.* 1905, 512, f.) Leguminosæ. H. A handsome spineless variety with finer leaves than the type. Said to be sterile. (C. Breton, Orleans, France.)

Gloriosa rothschildiana citrina. (*G. C.* 1905, xxxviii. 67, 211, f.) Liliaceæ. S. A handsome form with citron yellow flowers and somewhat narrower leaves than the type. The centre and tip of each segment is marked with a claret-coloured band which spreads over the whole surface as the flowers mature. Uganda. (Lord Rothschild, Tring Park.)

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***Gloriosa virescens grandiflora.** (*Gard.* 1905, lxviii. 250.) S. A yellow-flowered variety. Natal. (Kew.)

***Gnidia polystachya.** (*B. M.* t. 8001.) Thymelæaceæ. G. A handsome shrub from 1–6 ft. high, producing numerous pubescent branches of graceful habit. Leaves small, glabrous, imbricate and crowded. Flowers small, yellow, borne in numerous terminal heads. S. Africa. (Cambridge B. G.) [A less ornamental form of this species is figured in *B. M.* t. 1433 as *G. imberbis.*]

***Gunnera arenaria.** (*Gard.* 1905, lxvii. 39.) Haloragaceæ. H. A dwarf creeping plant, producing tufts of numerous ovate fleshy leaves, about 1 in. in length. Flowers small, borne on a short inflorescence, succeeded by crimson berries. New Zealand. (Kew.) [Syn. *G. densiflora var. depressa.*]

***Gunnera dentata.** (*Gard.* 1905, lxvii. 39.) H. Another dwarf creeping species, forming a mass of tufted rhizomes bearing small obovate leaves and small inconspicuous flowers. New Zealand. (Kew.)

Gunnera scabra major. (*G. C.* 1905, xxxvii. 18.) H. A very strong growing form. (? T. Smith, Newry.)

Gypsophila repens rosea. (*Gard.* 1905, lxviii. 25.) Caryophyllaceæ. H. A floriferous pink-flowered form. Origin not stated. (E. Heinrich.)

Hedychium bousigenianum. (*R. H.* 1905, 441, f.) Scitamineæ. S. A perennial with short thick rhizomes and semi-erect herbaceous stems about 3 ft. high. Leaves sheathing, from 1½–2 ft. long, by 2–4 in. broad, bright green above, paler beneath. Flowers large, from 18–25 in a terminal spicate inflorescence, produced on the year old growths, pale yellow, with brilliant red anthers and filaments. Cochin China. (Paris B. G.)

Helionopsis breviscapa. (*G. C.* 1905, xxxvii. 172, 178, f.; *Gard.* 1905, lxviii. 45, f.) Liliaceæ. H. Plant of tufted habit, 6–8 in. high. Leaves broadly lanceolate. Flowers in racemes, white, bell-shaped. Japan. (Barr & Sons.)

***Helxine Soleirolii.** (*Gartenwelt*, ix. 1905, 246, f.) Urticaceæ. H. H. or G. A tiny plant of creeping habit. Leaves bright green, alternate, cordate-reniform. Stems slender, reddish. Corsica and Sardinia.

Hemerocallis Corona. (*G. C.* 1905, xxxvii. 397; *Gard.* 1905, lxviii. 28, f.) Liliaceæ. H. A floriferous form with golden yellow flowers, raised from *H. flava* and *H. aurantiaca major.* (G. Yeld, York.)

***Hippeastrum aulictre.** (*G. C.* 1905, xxxvii. 164.) Amaryllidaceæ. G. A garden hybrid between *H. aulicum* and *H. equestre.* (A. Worsley.)

Hippeastrum aulicum × vittatum. (*G. C.* 1905, xxxvii. 164.) G. A garden hybrid. (A. Worsley.)

Hippeastrum Mandevillei. (*G. C.* 1905, xxxvii. 164) G. "A quaint and brilliantly-marked hybrid." (A. Worsley.)

Iguanura Curtisii. (*G. C.* 1905, xxxviii. 117; *R. H. B.* 1905, 209.) Palmæ. S. Name only. (F. Sander & Sons.)

Ionopsis testiculata. (*G. C.* 1905, xxxviii. 259.) Orchidaceæ. S. Leaves tufted, 4 to 5 in. long, terete, acuminate. Flowers small, whitish, numerous, borne on a branching scape 6 in. long. Jamaica. (C. Franck.)

***Iris galatica.** (*Gard.* 1905, lxvii. 203; *G. W.* 1905, 209.) Iridaceæ. H. A near ally of *I. persica.* "The colour of the flower varies from greenish yellow to silver grey, suffused to some extent with purple, and with deeper purple falls." Galatia. (W. Siehe, Mersina, Asia Minor.)

Ismene festalis. (*G. C.* 1905, xxxvii. 344; xxxviii. 322.) Amaryllidaceæ. G. A bigeneric garden hybrid between *I. calathina* and *Elisena longipetala.* (A. Worsley.)

***Kalanchoe angolensis.** (*G. C.* 1905, xxxvii. 370.) Crassulaceæ. G. Remarkable for the great variability in the number of its corolla-lobes. Flowers bright yellow, numerous. Leaves opposite, fleshy, up to 4 in. in length and 2 in. across. Portuguese West Africa. (Kew.)

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***Kalanchoe magnidens.** (*G. C.* 1905, xxxvii. 370.) G. A species producing numerous small salmon-coloured flowers. Uganda. (Kew.)

Kentia Alberti. (*R. H. B.* 1905, 136.) Palmæ. S. Described as a new species. (Jacob-Makoy & Cie, Liege.)

Kentia forsteriana striata. (*R. H. B.* 1905, 23.) S. A form with striped leaves. (M. L. Cardon, Belgium.)

***Lachenalia d'Anconæ.** (*G. W.* 1905, 70.) Liliaceæ. G. A form with light yellow flowers, tipped with green and purple. (Dammann & Co., Naples.) [*L. tricolor* var.]

Lælio-Cattleya Alexandri. (*O. R.* 1905, 317.) Orchidaceæ. S. A garden hybrid between *C. granulosa schofieldiana* and *L.-C. elegans*. (Major Holford.)

Lælio - Cattleya beyrodtiana. (*R. H.* 1905, 228; *J. H. F.* 1905, 213.) S. A garden hybrid between *L.-C. elegans* and *C. lawrenceana*. (C. Maron, Brunoy, France.)

Lælio - Cattleya chardwarensis. (*G. C.* 1905, xxxviii. 74.) S. A garden hybrid between *L. cinnabarina* and *C. dolosa*. (G. F. Moore.)

Lælio-Cattleya chocophylla. (*R. H.* 1905, 106.) S. A garden hybrid between *C. chocoensis* (*quadricolor*) and *L. harpophylla*. (Ch. Béranek, Paris.)

Lælio-Cattleya crispo-hardyana. (*G. C.* 1905, xxxviii. 254; *O. R.* 1905, 317.) S. A garden hybrid between *L. crispa* and *C. hardyana*. (Major G. L. Holford.)

Lælio-Cattleya epicasta superba. (*O. R.* 1905, 26.) S. A large-flowered form. (J. Colman.)

Lælio-finckenniana. (*R. H. B.* 1905, 48.) S. A natural hybrid between *L. albida* and *L. anceps sanderiana*. Flowers white with purplish-violet lip. (Marquis de Wavrin, Château de Ronsele, Belgium.)

***Lælio-Cattleya gottoiana.** (*R. H. B.* 1905, 212.) S. A garden hybrid between *C. Warneri* and *L. tenebrosa*. (F. Lambeau, Brussels.)

Lælio-Cattleya heatonensis. (*R. H.* 1905, 571.) S. A garden hybrid between *Lælia* (*Brassavola*) *digbyana* and *Cattleya hardyana*. (M. Ginot, St. Etienne, France.)

Lælio-Cattleya Schneideri. (*O. R.* 1905, 23.) S. A garden hybrid between *L.-C. Amelia* and *Cattleya dowiana aurea*. (E. Cappe, Vesinet, France.)

Lælio-Cattleya Seguini. (*R. H.* 1905, 228.) G. A garden hybrid, probably between *L. cinnabarina* and *C. Schroederæ* [*C. labiata* var.]. (M. Séguin, France.)

Lælio - Cattleya Skinnerobarina. (*R. H.* 1905, 106.) S. A garden hybrid between *C. Skinneri* and *L. cinnabarina*. (Ch. Béranek, Paris.)

Lælio-Cattleya solangeana. (*R. H.* 1905, 571.) S. A garden hybrid between *L. Perrinii* and *C. Eldorado*. (M. Ginot, St. Etienne, France.)

Lælio - Cattleya vivicans. (*O. R.* 1905, 286.) A garden hybrid between *L.-C. elegans* and *C. Eldorado*. (F. Sander & Sons.)

Lamium puralbum. (*G. W.* 1905, 489.) H. A garden hybrid between *L. purpureum* and *L. album*.

Lepidagathis Pobeguini. (*B. M. H. N.* 1905, 64.) Acanthaceæ. S. A curious plant with *Lycopodium*-like stems 6–8 in. high, growing in small tufts. Flowers dark purple, produced at the bases of the stems. Upper Guinea. (Paris B. G.)

***Leptotes unicolor.** (*O. R.* 1905, 44.) Orchidaceæ. S. An interesting plant of pendulous habit, having pale lilac flowers, generally borne in pairs, and short fleshy leaves. Brazil. (Glasnevin B. G.)

Lilium Doei. (*J. of H.* 1905, li. 27.) Liliaceæ. H. Described as a hybrid; resembles *L. longiflorum*. Origin not stated.

***Lilium Yoshidaii.** (*Gard.* 1905, lxviii. 238, f.) H. Stated to be a new species, with fragrant flowers resembling *L. Brownii*. (Max Leichtlin, Baden-Baden.)

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***Lissochilus Mahoni.** (*B. M.* t. 8047.) Orchidaceæ. S. A new species. Leaves lanceolate, bright green, 6 ft. in length and 4 in. in breadth. Scape about 8 ft. high. Flowers large, with reflexed green sepals lined with brown; petals 1½ in. long, rosy-pink, the outside somewhat darker. The erect side lobes of the lip are green, lined with brown; front lobe purple, with a pale yellow crest at the back. Uganda. (Kew.)

***Lissochilus Ugandæ.** (*B. M.* t. 8044.) S. A species of moderate growth. Leaves narrow, ligulate, 2–3 ft. long, glaucous green. Flowering scape from 3–4 ft. in height. Flowers yellow; sepals reflexed, tipped and margined with brown; petals incurved over the three-lobed lip. Uganda. (Kew.)

Lomaria drapsiana. (*R. H. B.* 1905, 137, 278.) Filices. G. No description given. (M. Draps-Dom, Laeken, Belgium.)

Lonicera tatarica var. **purpurea.** (*W. G.* 1905, 84, f.) Caprifoliaceæ. H. A form with bright purple flowers. Origin not stated.

Macludrania hybrida. (*R. H.* 1905, 362.) Urticaceæ. H. A bigeneric garden hybrid between *Maclura aurantiaca* var. *inermis* and *Cudrania triloba*. (E. André, La Croix, France.)

Malus Zumi. (*T. & S.* i. 191, t. 91.) Rosaceæ. H. A medium-sized tree of erect growth. Leaves 1½–3 in. long, petiolate, ovate-oblong. Flowers white, about 1 in. across, in umbels of 4 to 6. Japan. (Arnold Arboretum.) [*Pyrus.*]

Mammillaria camptotricha. (*Gartenwelt*, 1905, x. 14; *M. K.* 1905, 176.) Cactaceæ. S. A handsome short-stemmed species. Stem depressed at the summit, 2 to 3 in. in diameter. Tubercles conical, about ½ in. long. Radiating spines 6 to 8, curved, yellowish, turning to grey, from ¼ in. to over 1 in. long. Flowers yellowish-white. Mexico. (E. Dams, Deutsch-Wilmersdorf, Germany.)

Mammillaria Rüstii. (*M. K.* 1905, 173.) G. Stem almost globose, depressed at the summit, 2 in. high and 1½ in. in diameter, clothed with white woolly hairs and reddish-brown spines. Tubercles from 3 to 4 lines long, with 16–18 radiating and 4 central spines. Flowers unknown. Honduras. (Dr. Rüst, Hanover, Germany.)

Marica Helenæ. (*J. R. H. S.* xxviii. 530.) Irideæ. H. H. Allied to *M. coerulea*. Flowers nearly 5 in. across, blue and white, borne on long leaf-like scapes. Brazil. (A. Worsley.)

Megaclinium arnoldianum. (*G. C.* 1905, xxxviii. 191.) Orchidaceæ. S. Name only. (Brussels B. G.)

Mormodes buccinator var. **aurantiacum.** (*B. M.* t. 8041.) Orchidaceæ. S. A variety with deep orange-yellow flowers. Peru. (M. M. Linden, Brussels.)

Narcissus montas. (*G. C.* 1905, xxxvii. 82, f.) Amaryllidaceæ. H. "A hybrid between *Corbularia monophylla* and a florists' variety of *N. Tazetta*." (Sir M. Foster.)

Nepenthes boisiana. (*G. C.* 1905, xxxviii. 380.) Nepenthaceæ. S. "A cross between *N. Tiveyi* and *N. Morganiæ*. (R. J. Desloges, Paris.)

Nepenthes Deslogeii, N. Gamerii, and **N. Vallierse.** (*G. C.* 1905, xxxviii. 379.) Garden hybrids between *N. Tiveyi* and *N. mirta*. (R. J. Desloges, Paris.)

Nephrolepis Amerpohli. (*J. of H.* 1905, li. 251.) Filices. S. A new form of the Boston Fern (*N. exaltata* var.) with finely divided pinnæ. (R. Amerpohl, Janesville, Wisconsin.)

***Nephrolepis Piersoni compacta** (*J. of H.* 1905, li. 313, f.) and **N. P. elegantissima.** (*G. W.* 1905, 232; 239, f.; 241, f.) S. Forms with remarkably dense fronds. (F. R. Pierson & Co., Tarrytown, New York.)

Nerine Gaimini. (*G. C.* 1905, xxxvii. 164.) Amaryllidaceæ. G. "An erect-flowered form belonging to the *sarniensis* section." (A. Worsley.)

Nerine Zoroasteri. (*G. C.* 1905, xxxvii. 164.) G. A garden hybrid between *N. pudica* and *N. sarniensis*. (A. Worsley.)

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Nicotiana arborea semperflorens. (*Gfl.* 1905, 43, f.) Solanaceæ. G. A garden hybrid between *N. tomentosa variegata* and *N. Tabacum*. (Franz Ament, Saalfeld, Germany.)

Notonia amaniensis. (*N. B.* iv. 182, f.) Compositæ. S. A handsome succulent with spathulate fleshy leaves about 6 in. long by 1½ in. wide. Scape up to 4 ft. high, carrying 3 or more heads of yellow flowers borne on long reddish peduncles. East Tropical Africa. (Berlin B. G.)

Odontoglossum Adrianæ grandiflorum. (*O. R.* 1905, 185, f.) Orchidaceæ. G. A handsome form. Origin uncertain. (D. E. Taylor.)

Odontoglossum amabile. (*G. C.* 1905, xxxvii, 174.) Orchidaceæ. G. A garden hybrid. Parentage not stated. (C. Vuylsteke, Ghent.)

Odontoglossum blando-nobile. (*O. R.* 1905, 82.) S. A garden hybrid between *O. blandum* and *O. Pescatorei*. (A. de Lairesse, Liége, Belgium.)

Odontoglossum crispum × luteo-sceptrum. (*J. H. F.* 1905, 213.) G. A garden hybrid. (M. Bert, Bois-Colombes, France.)

Odontoglossum crispum purpurascens. (*G. C.* 1901, xxix, 210; *O. R.* 1901, 120.) G. A variety with fringed sepals and petals; ground colour rosy-lilac, the centre marked with purple. Lip nearly white, spotted with brown. (Sir T. Lawrence.)

Odontoglossum crispum smeeanum. (*G. C.* 1905, xxxvii. 268.) G. A rose-pink form, the inside of the segments spotted with light-brown. (N. C. Cookson.)

Odontoglossum crispum solum. (*G. C.* 1905, xxxvii. 181, 322, f.) G. A distinct form; column and lip claret-purple, the segments occasionally spotted with the same colour. (W. Thompson.)

Odontoglossum excellens × crispum. (*J. F. H.* 1905, 213.) G. A garden hybrid. (M. Bert, Bois-Colombes, France.)

***Odontoglossum harryano-triumphans.** (*G. C.* 1905, June 3, Suppl. i.) G. Apparently a garden hybrid between the species indicated. (Sir F. Wigan.)

Odontoglossum lambeauianum. (*G. C.* 1905, xxxviii. 324, f.; *R. H. B.* 1905, 263.) G. A garden hybrid between *O. Rolfeæ* and *O. crispum*, var. (F. Lambeau, Brussels.)

Odontoglossum lapidense. (*G. C.* 1905, xxxviii. 36.) G. A garden hybrid between *O. Hallii* and *O. Rolfeæ*. (W. Thompson.)

Odontoglossum lawrenceanum. (*G. C.* 1905, xxxvii. 197, f.) G. A garden hybrid between *O. triumphans* and *O. Rolfeæ*. (C. Vuylsteke, Ghent.)

Odontoglossum maculatum var. marlfieldense. (*G. C.* 1905, xxxvii. 174.) G. "A fine variety." (R. Le Doux.)

Odontoglossum Smithii. (*G. C.* 1905, xxxviii. 411, 427, f.) G. A garden hybrid between *O. Rossii pubescens* and *O. harryano-crispum*. (Charlesworth & Co.)

Odontoglossum thompsonianum. (*G. C.* 1905, xxxvii. 268, 285, f.; *Gard.* 1905, lxvii. 290, f.; *O. R.* 1905, 175, 241, f.) G. A garden hybrid between *O. crispum* and *O. Edwardii*. (W. Thompson.)

Odontoglossum Vuylstekiæ. (*G. C.* 1905, xxxviii. 348, 379, f.) G. A remarkable secondary hybrid of unrecorded parentage. (C. Vuylsteke, Ghent.)

Odontoglossum warnhamense. (*O. R.* 1905, 157.) G. A garden hybrid between *O. Hallii* and *O. Pescatorei*. (C. J. Lucas.)

Odontoglossum wiganianum. (*G. C.* 1905, xxxvii. 237, 274, f.) A garden hybrid between *O. wilckeanum* and *O. Rolfeæ*. (C. Vuylsteke, Ghent.)

Odontonia Lairessiæ. (*G. C.* 1905, xxxvii. 398; xxxviii. 2, f.; *O. R.* 1905, 217, f.) Orchidaceæ. G. A garden hybrid between *Odontoglossum crispum* and *Miltonia Warscewiczii*. (M. A. de Lairesse, Belgium.)

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Oliverella elegans. (*B. N. Y. B. G.* iii. 2.) Crassulaceæ. G. Described as a new genus. "Found in cultivation at Amacamaca, near the City of Mexico." (Washington B. G.)

Oncidium calloglossum var. **concolor.** (*R. H. B.* 1905, 236.) Orchidaceæ. G. A yellow flowered form. (F. Lambeau, Brussels.)

Oncidium corynephorum. (*G. C.* 1905, xxxviii. 316, 340, f.) G. A very handsome species, allied to *O. leopoldianum*, under which name it was erroneously shown. Inflorescence twining, several feet in length. Flowers from 1½–2 in. across, with broad undulating sepals and petals, rosy violet in colour, margined with creamy white. The lip is purple with a bright yellow base. Peru. (E. Ashworth.)

Oncidium Lowii. (*G. C.* 1905, xxxvii. 174; *G. W.* 1905, 272.) G. "A supposed natural hybrid between *O. cavendishianum* and *O. luridum* or *carthaginense*." Leaves 1½-2½ ft. long. Inflorescence over 6 ft. in length, carrying numerous yellow flowers spotted with brown. (H. Low & Co.)

Oroxylum flavum. (*T. & S.* i. 193, t. 92.) Bignoniaceæ. G. An ornamental tree. Leaves opposite, bipinnate, borne on petioles up to 2½ ft. long; individual leaflets from 4-7 in. long. Flowers handsome, yellow, in terminal panicles. China. (Arnold Arboretum.)

Pachyphytum uniflorum. (*B. N. Y. B. G.* iii. 11.) Crassulaceæ. S. Described as a new species, found and cultivated at San Luis Potosi, Mexico.

Pæonia lutea superba. (*G. C.* 1905, xxxvii.) Ranunculaceæ. G. A variety with larger flowers than the type. (V. Lemoine et Fils, Nancy.)

Pandanus wavrinianus. (*G. C.* 1905, xxxviii. 117.) Pandaneæ. S. A seedling *Pandanus* distributed with this name. (F. Sander & Sons.)

Paulownia imperialis var. (*J. H. F.* 1905, 324.) Scrophulariaceæ. H. A form with white flowers. China. (M. de Vilmorin; G. Boucher. Paris.)

Peliosanthes Teta var. **mantegazziana.** (*B. T. O.* 1905, 50, f.) Hæmodoraceæ. S. A form with less rigid leaves than the type. Malaya, &c.

Phaius Blumei sanderianus. (*W. G.* 1905, 263.) Orchidaceæ. S. A form with yellowish-brown flowers, the lip white and purple. Java. (C. J. Kikkert, Haarlem.)

Phaylopsis Barteri. (*B. M. H. M.* 1905, 60.) Acanthaceæ. S. Stems herbaceous, quadrangular, nearly glabrous, the internodes swollen towards the base. Leaves in pairs, on long petioles, the blade oval-oblong, intense green, paler beneath, up to 5 in. long. Flowers in cymes, white, passing into pale pink. Upper Guinea. (Paris B. G.)

Phellodendron sachalinense. (*T. & S.* i. 199, t. 94.) Rutaceæ. H. An ornamental species with pinnate leaves 9–12 in. long. Flowers in small panicles. Japan. (Arnold Arboretum.)

***Phlox divaricata** var. **Laphamii.** (*G. C.* 1905, xxxvii. 349.) Polemoniaceæ. H. A robust variety with rounded petals and flowers of deeper colour than the type. (A. Perry.) [Syn. *P. canadensis*, var.]

Physalis Bunyardii. (*G. C.* 1905, xxxviii. 315, f.) Solanaceæ. H. A garden hybrid between *P. Francheti* and *P. Alkekengi*. (G. Bunyard & Co.)

Pittosporum allicioides. (*W. G.* 1905, 76.) Pittosporaceæ. H. Described as a handsome evergreen shrub with glossy green leaves and greenish-yellow flowers, in general appearance resembling *Illicium anisatum*. Japan.

Pleroma candida. (*Bull. Cat.* 1905, 11.) Melastomaceæ. S. A plant of shrubby habit. Leaves ovate-lanceolate, densely covered with hair, prominently veined on the lower surface. Flowers in loose terminal heads, pure white, 1½–1¾ in. across. South Australia. (W. Bull & Sons.)

***Polygala Vayredæ.** (*G. W.* 1905, 407.) Polygalaceæ. H. or H. H. A small plant, only a few inches in height, with linear evergreen leaves and purplish flowers. Closely resembles *P. Chamæbuxus*. Spain.

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Polystachya ensifolia. (*O. R.* 1905, 91.) Orchidaceæ. S. A curious species with erect stems, bearing linear-oblong leaves 4 to 6 in. long. Flowers numerous, tawny yellow, carried on an erect inflorescence. Tropical Africa. (F. Sander & Sons.)

***Polystachya haroldiana.** (*G. C.* 1905, xxxvii. 333.) S. Of tufted growth, with short compressed pseudo-bulbs. Flowers white, the sepals tinged with green, borne on a short spike. Lake Tanganyika Region, Tropical Africa. (N. C. Cookson.)

***Polystachya Laurentii.** (*R. H. B.* 1905, 277.) S. Name only. Congo. (Brussels B. G.)

***Polystachya mystacidioides.** (*O. R.* 1905, 188.) S. A very distinct plant, with branched stems over 3 ft. long. Leaves lanceolate, 1–1½ in. long, dull green, covered with tiny dots. Flowers lurid purple and flesh-coloured, half an inch long, solitary. Congo. (Brussels B. G.; Kew.)

Polystachya Polychaete. (*R. H. B.* 1905, 63, f.) S. Chiefly of botanical interest. Tropical Africa. (Jardin Colonial, Laeken, Brussels.)

***Primula Arendsi.** (*G. C.* 1905, xxxvii. 349.) Primulaceæ. H. H. or G. Said to be a hybrid between *P. obconica* and *P. megaseæfolia*. (G. Arends, Ronsdorf, Germany.)

***Primula cockburniana.** (*G. C.* 1905, xxxvii. 331, f.; 345.) H. A species of slender habit, distinguished from all others by the orange-scarlet colour of the flowers, which are borne in whorls. Leaves obovate-oblong, irregularly toothed, slightly farinose. West China. (J. Veitch & Sons.)

***Primula deorum.** (*G. C.* 1905, xxxvii. 98, f.) H. An interesting species, some 8 in. high. Leaves coriaceous, bluish-green. The scape, bracts and calyx are covered with a viscid exudation. Flowers in umbels of about 20, purplish-violet. Mt. Rilo, Bulgaria. (W. T. Hindmarsh.)

***Primula japonica** var. **pulverulenta.** (*G. C.* 1905, xxxvii. 301,) H. A distinct variety, differing from the type in the white powdery scape and inflorescence, the longer calyx-lobes and deep crimson flowers. West China. (J. Veitch & Sons.) [*P. pulverulenta*, Duthie in *G. C.* 1905, xxxviii. 259.]

Primula tangutica. (*B. M.* t. 8043.) H. A very distinct species with a stout scape attaining 3 ft. in height. Leaves all radical, glabrous, from 3–4½ in. long. Flowers brownish-purple, fragrant, in whorls. West China & Tibet. (J. Veitch & Sons.)

***Primula Veitchii.** (*B. M.* t. 8051; *G. C.* 1905, xxxvii. 344, f.) H. A handsome plant somewhat resembling *P. cortusoides* but of stronger growth. Leaves radical, dark green, the under surface densely covered with white woolly tomentum. The umbels of rosy purple flowers about an inch in diameter are carried on stout scapes of over a foot in height. China. (J. Veitch & Sons.)

***Primula vittata.** (*G. C.* 1905, xxxvii. 333, 390, f.) H. A strong-growing species with erect narrow serrate leaves. The flowering-spike attains a height of upwards of 18 in. Flowers drooping, magenta-purple, disposed in whorls. West China and Tibet. (J. Veitch & Sons.)

Promenæa crawshayana. (*O. R.* 1905, 222.) See under *Zygopetalum*.

Prunus blireiana fl. pl. (*R. H.* 1905, 273, 392, f.) Rosaceæ. H. A seedling of *P. Mume* or *P. cerasifera purpurea*. Foliage similar to the latter. Flowers double or semi-double, bright rose-pink. (E. André, La Croix, France.)

Prunus Pissardi Moseri fl. pl. (*Jard.* 1905, 200, f.) H. A form with double pink flowers. (R. & M. Moser, Versailles.) [*P. cerasifera*, var.]

Pseudotsuga Fretsi. (*W. G.* 1905, 262.) Coniferæ. H. A seedling form. Origin not stated. (C. Frets & Sons, Boskoop, Holland.)

Pulmonaria arvernensis alba. (*G. C.* 1905, xxxvii. 172, 261.) Boragineæ. H. A white-flowered form. (J. Backhouse & Sons.)

Quercus Alberti. (*G. M.* 1905, 559.) Cupuliferæ. H. Large-leaved and of ornamental appearance. (Paul & Son.)

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***Raphia Laurentii.** (*R. H. B.* 1905, 70.) Palmæ. S. No description given. Congo? (Brussels B. G.)

Rodgersia pinnata alba. (*G. C.* 1905, xxxvii. 398.) Saxifragaceæ. H. A form producing large panicles of white flowers. (J. Veitch & Sons.)

***Rosa Hugonis.** (*B. M.* t. 8004.) Rosaceæ. H. An erect-growing species with slender purple-brown stems of branching habit. Leaves thin and glabrous, 2 to 4 in. long, composed of 5 to 11 leaflets. Flowers yellow, 2½ in. across, on solitary flower-stalks. West China. (Kew.)

***Rosa microphylla × rugosa.** (*R. H.* 1905, 144, f.) H. A garden hybrid. Flowers pale lilac, over 4 in. across. Fruits orange-red. (Strasburg B. G.)

Rosa sericea var. **pteracantha.** (*G. C.* 1905, xxxviii, 238, 253, 260, f.) H. A curious variety with large brilliant red prickles, turning brown with age. Stems clothed with bright red bristles. Two forms are known—one with red, the other yellow fruits. Flowers, leaves and habit of growth similar to those of the type. West and Central China. (Vilmorin Andrieux et Cie., Paris.)

Rosa setigera × canina. (*Gartenwelt*, 1905, x. 39.) Of garden origin. (F. Pollmer, Germany.)

Rubus innominatus. (*G. C.* 1905, xxxviii. 290, f.) Rosaceæ. H. Of handsome appearance and vigorous growth. Stems very pubescent, 6–8 ft. long, prickles not numerous. Leaves large, dark green, the lower surface greyish-white, 3-foliate or 5-foliate. Flowers in panicles up to 18 in. long, inconspicuous, succeeded by orange-red edible fruits. Central China. (J. Veitch & Sons.) [Syn. *R. kuntzeanus*.]

Rungia eriostachya. (*B. M. H. N.* 1905, 62.) Acanthaceæ. S. A pubescent-stemmed plant, bearing ovate-lanceolate leaves, 2–3 in. long, and crowded spikes of white and yellow flowers, the bracts and calyxes covered with long white hairs. Upper Guinea. (Paris B. G.)

Sagittaria macrophylla. (*G. C.* 1905, xxxviii. 200, 217.) Alismaceæ. H. "A variety with large foliage and tall lax spikes of white flowers." (A. Perry.)

***Salvia turkestanica.** (*R. H. B.* 1905, 174.) Labiatæ. H. Flowering spikes up to 2½ ft. high. Stems rigid, quadrangular, tinged with pink. Basal leaves on long petioles, decreasing in size towards the summit. Flowers white, tinged with rose. Turkestan. (M. Bruant, Poitiers, France.)

Sarracenia cookeana × Courtii. (*W. G.* 1905, 409, f.) Sarraceniaceæ. G. Variously coloured forms of garden origin. (Schönbrunn Hofgarten, Austria.)

Sarracenia crispiana. (*G. C.* 1905, xxxviii. 238.) G. A garden hybrid between *S. Courtii* and *S. sanderiana*. (A. J. A. Bruce.)

Sarracenia flava gigantea. (*G. C.* 1905, xxxvii. 349.) G. A very strong grower, nearly 3 ft. high. Pitchers green, with a red-veined "lid." (A. J. A. Bruce.)

Scaphyglottis cogniauxiana. (*G. C.* 1905, xxxvii. 33.) Orchidaceæ. S. A small species with narrow leaves from 2–4 in. in length. Flowers greenish-yellow; sepals pointed; petals subacute. Allied to *S. prolifer*. Brazil. (Brussels B. G.)

Schizandra Henryi. (*G. C.* 1905, xxxviii. 162, f.) Magnoliaceæ. H. A climbing shrub with winged and more or less triangular stems. Leaves coriaceous, shining, with bright red petioles, the form varying from elliptic to cordate-ovate on the same plant. Flowers white, on long peduncles, unisexual. Fruits fleshy, edible. Central China. (J. Veitch & Sons.)

***Scilla messeniaca.** (*B. M.* t. 8035.) Liliaceæ. H. Leaves broadly linear, up to 9 in. long. Scape angular, carrying a raceme of 10 to 20 flowers. Perianth pale blue, with spreading segments. Greece. (M. Leichtlin, Baden-Baden; Kew.)

Sedum diversifolium. (*B. N. Y. B. G.* iii. 42, 44.) Crassulaceæ. S. Described as a new species. Mexico. (New York & Washington B. G.)

Senecio (Ligularia) veitchianus. (*G. C.* 1905, xxxviii. 212, 455, f.) Compositæ. H. A robust perennial with strong unbranched flowering spikes from 3–6 ft. high. Leaves

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large, triangular-cordate, up to 1½ ft. in length, with solid petioles 1½ to 2 ft. long. The single flower-heads are bright yellow and 2½ in. across. West and Central China. (J. Veitch & Sons.)

***Senecio (Ligularia) wilsonianus.** (*G. C.* 1905, xxxviii. 212.) H. Of less vigorous growth than *S. veitchianus*. Leaves cordate or reniform, with hollow pubescent stalks. Flowering stems branched in the middle, from 3 to 5 ft. high; flower-heads golden yellow, hardly 1 in. across. China. (J. Veitch & Sons.)

***Serratula atriplicifolia.** (*Veitch Cat.* 1905, f.) Compositæ. H. A new species of vigorous growth, with large heart-shaped leaves and globular heads of purple flowers, attaining a height of 5 ft. Central China. (J. Veitch & Sons.)

***Spartina cynosuroides, var. aureo-marginata.** (*G. C.* 1905, xxxviii. 372.) Gramineæ. H. A distinct variety of graceful growth, 5–6 ft. high, the leaves striped with golden bands running throughout their length. (New York B. G.)

***Spiræa Billardi.** (*W. G.* 1905, 369.) Rosaceæ. H. A garden hybrid between *S. Douglasi* and *S. salicifolia*. "Raised by a Philadelphian nurseryman."

Stanhopea wolteriana. (*G. C.* 1905, xxxviii. 102, f.; *O. R.* 1905, 272; *Gartenwelt*, 1905, x. 22.) Orchidaceæ. G. A garden hybrid between *S. martiana* and *S. tigrina*. (R. Wolter, Magdeburg, Germany.)

Stapelia divergens. (*G. C.* 1905, xxxvii. 49.) Asclepiadaceæ. G. A new species with glabrous 4-angled stems, 1½ to 3 in. high. Flowers about 2 in. across, yellow, lined and spotted with brownish-crimson. Annulus slightly raised, nearly circular, with a horizontally spreading rim. "Origin unknown; probably a native of South Africa." (Sir T. Hanbury, La Mortola.)

Stapelia putida. (*M. K.* 1905, 159.) G. A small plant about 1½ in. high. Stems 4-sided, with rounded angles, slightly toothed, shining green. Flowers dull red. Annulus spotted brown. S. Africa. ? (Sir T. Hanbury, La Mortola.)

***Stenanthium robustum.** (*G. C.* 1905, xxxviii. 190; *Gard.* 1905, lxviii. 177, f.) Liliaceæ. H. Described as a new species with white fragrant flowers borne on an inflorescence 18 in. high. (A. Perry.)

***Streptocarpus grandis.** (*B. M.* t. 8042.) Gesneraceæ. S. Allied to *S. Saundersii*. Leaf from 2–3½ ft. long and up to 2½ ft. broad, ovate, cordate, covered on both sides with short stiff hairs. Flowers in pairs on numerous branching stems from 1½ to over 3 ft. high; corolla-tube about 1 in. long, light blue, white inside, the throat marked with violet. Zululand. (Kew.)

Stylophyllum Orcuttii, (*B. N. Y. B. G.* iii. 36.) Crassulaceæ. G. Said to be a new genus. California. Distributed as *Cotyledon attenuata*.

***Townsendia wilcoxiana.** (*I. S. H. T. V.*, 103 t. 185.) Compositæ. H. A small stemless plant. Leaves disposed in rosettes, spathulate, hairy, 1–1½ in. long. Flower-heads about ½ in. across, yellow, carried on short scapes. United States. (M. Van den Boesche, Tirlemont, Belgium.)

Tradescantia fluminensis. (*Gartenwelt*, 1905, x. 116.) *Commelinaceæ*. S. A tropical species with prostrate stems and reddish leaves. Brazil. (H. Kohlmannslehner, Britz, Berlin.)

Trichopteris Alberti. (*R. H. B.* 1905. 275.) Filices. S. No description given. Congo. (Ed. Pynaert-Van Geert, Ghent.) [*Alsophila* sp.]

***Trillium grandiflorum roseum.** (*G. C.* 1905. xxxvii. 375.) Liliaceæ. H. A form with pink flowers.

Tritonia clusiana. (*G. C.* 1905. xxxviii. 269.) Iridaceæ. H. Apparently a new species, which "seems to form a link between *Tritonia* and *Antholyza*, the flowers being hooded as in the latter genus. The plant is about a foot high." S. Africa. (A. Worsley.)

***Tulipa dasystemon.** (*G. C.* 1905. xxxvii. 268.) Liliaceæ. H. Of dwarf habit, producing several white and yellow flowers in succession from a single stem. Glossy foliage. (Cutbush & Sons.)

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Tulipa fosteriana. (*G. C.* 1905. xxxvii. 268.) H. Flowers of a brilliant crimson, the segments blotched at the base. (Miss Willmott.)

Urbinia obscura. (*B. N. Y. B. G.* iii. 12.) Crassulaceæ. G. Described as a new genus. Mexico. (New York B. G.)

***Vanda Watsoni.** (*G. C.* 1905, xxxvii. 82, 123, f.) Orchidaceæ. S. Allied to *V. kimballiana* but differing in the shape and colour of the flowers. Leaves up to 14 in. long by 2 lines broad, subterete, dark dull green. Flowers white, the crest and inner surface of the sac deep yellow spotted with reddish-brown, borne on slender scapes 1–1½ ft. long. Annam. (F. Sander & Sons.)

Villadia ramosissima. (*B. N. Y. B. G.* iii. 5.) Crassulaceæ. G. Described as a new genus. Mexico. (Washington B. G.)

Vitis Titanea. (*Vilm. Cat.* 1905, 64.) Ampelidaceæ. H. A vigorous species, recently introduced from Japan. Leaves with rounded lobes, dark green. Flowers succeeded by small bunches of black berries. (Vilmorin Andrieux & Cie., Paris.)

Vriesia corallina. (*J. H. F.* 1905, 106.) Bromeliaceæ. S. A garden hybrid between *V. Rex* and *V. aurantiaca*. (Luxembourg Gardens, Paris.)

Vriesia luxemburgiana. (*J. H. F.* 1905, 106.) S. A garden hybrid between *V. aurantiaca* and an unknown species. (Luxembourg Gardens, Paris.)

Vriesia majestica. (*J. H. F.* 1905, 105.) S. A garden hybrid between *V. kitteliano-Rex* and *V. Vigeri*. (L. Duval & Sons, Versailles.)

Vriesia rubra superba. (*J. H. F.* 1905, 106.) S. A garden hybrid between *V. Rex* and an unknown species. (Luxembourg Gardens, Paris.)

Zygopetalum Ballii. (*G. C.* 1905, June 3, Suppl. iii.; *G. M.* 1905, 365, f.; *J. of H.* 1905. l. 551, f.) Orchidaceæ. G. A natural hybrid of *Z. rostratum*. The petals and sepals are heavily blotched with purple, and broadly margined with greenish-white. Lip white, marked with purple at the base. (E. Ashworth.)

Zygopetalum Binoti. (*G. C.* 1905, xxxviii. 258; *O. R.* 1905, 336.) S. Probably a natural hybrid. Pseudobulbs ovate-oblong, about 3 in. long by 1½ in. wide, bearing two linear-lanceolate leaves 12 in. long. Scapes bearing a raceme of 6 green flowers 2 in. across; lip three-lobed, greenish-white, the central lobe marked with eight purple ridges at the base. Brazil. (P. Binot, Petropolis, Brazil.)

Zygopetalum crawshayanum. *G. C.* 1905, xxxvii. 333.) G. A garden hybrid between *Z. xanthinum* and *Z. stapelioides*. (De B. Crawshay.)

Zygopetalum discolor atro-coeruleum. (*G. C.* 1905, xxxvii. 237.) G. A form with large creamy-white flowers, the petals shaded with light violet; lip broad, violet-coloured with a white crest. (F. Sander & Sons.)

Zygopetalum Mackayo-crinitum. (*G. C.* 1905, xxxvii. 78.) G. Apparently a garden hybrid between the species indicated. (F. Sander & Sons.)

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ROYAL BOTANIC GARDENS, KEW.

BULLETIN

OF

MISCELLANEOUS INFORMATION.

APPENDIX IV.—1906.

LIST of the STAFFS of the ROYAL BOTANIC GARDENS, Kew, and of Botanical Departments and Establishments at Home, and in India and the Colonies, in Correspondence with Kew.

* Trained at Kew. † Recommended by Kew.

Royal Botanic Gardens, Kew.—

Director	Lieut.-Col. D. Prain, I.M.S., C.I.E., M.A., M.B., LL.D., F.R.S., F.L.S.
Assistant (Office)	*John Aikman.
" "	*William Nicholls Winn.
Keeper of Herbarium and Library	*William Botting Hemsley, F.R.S., F.L.S.
Principal Assistant (Phanerogams)	Otto Stapf, Ph.D., F.L.S.
" " (Cryptogams)	George Massee, F.L.S.
Assistant (Herbarium)	Nicholas Edward Brown, A.L.S.
" "	*Robert Allen Rolfe, A.L.S.
" "	Charles Henry Wright, A.L.S.
" "	*Sidney Alfred Skan.
" "	Thomas Archibald Sprague, B.Sc., F.L.S.
" "	Arthur Disbrowe Cotton, F.L.S.
" for India	J. F. Duthie, B.A., F.L.S.
Honorary Keeper, Jodrell Laboratory	—
Assistant (Jodrell Laboratory)	Leonard Alfred Boodle, F.L.S.
Keeper of Museums	John Masters Hillier.
Assistant (Museums)	*John H. Holland, F.L.S.
Preparer	George Badderly.

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Curator of the Gardens - -	William Watson, A.L.S.
Assistant Curator - - -	*William J. Bean.
Foremen :—	
Herbaceous Department - -	*Walter Irving.
Greenhouse and Ornamental Department.	*Arthur Osborn.
Arboretum - - - -	*William Dallimore.
Tropical Department - -	*Charles P. Raffill.
Temperate House - - -	*William Taylor.
Storekeeper - - - -	*George Dear.

Cambridge.—University Botanic Garden :—

Professor - - -	——
Assistant Curator, University Herbarium.	R. H. Lock, M.A.
Secretary to Botanic Garden Syndicate	A. C. Seward, M.A., F.R.S., F.L.S.
Curator - - -	*Richard Irwin Lynch, M.A., A.L.S.

Dublin.—Royal Botanic Gardens, Glasnevin :—

Keeper - - -	Frederick W. Moore, A.L.S.

Trinity College Botanic Gardens :—

Professor - - -	H. H. Dixon, Sc.D.

Edinburgh.—Royal Botanic Garden :—

Regius Keeper - -	Isaac Bayley Balfour, M.D., Sc.D., F.R.S., F.L.S.
Assistant (Museum) -	H. F. Tagg, F.L.S.
„ (Herbarium)	*J. F. Jeffrey.
Head Gardener - -	*R. L. Harrow.
Assistant Gardener -	Henry Hastings.

Glasgow.—Botanic Gardens :—

University Professor -	F. O. Bower, M.A., Sc.D., F.R.S., F.L.S.
Curator - - -	James Whitton.

Oxford.—University Botanic Garden :—

Professor - - -	SydneyH.Vines,M.A., Sc.D., F.R.S., F.L.S.
Curator - - -	*William Baker.

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COLONIES.

Antigua.—Superintendent of Agriculture for the Leeward Islands. — Francis Watts, C.M.G., D.Sc., F.I.C., F.C.S.

Botanic Station :—

Curator - - -	*T. Jackson.
Acting Agricultural Assistant.	W. J. Abbott.

Bahamas.—Botanic Station :—

Curator - - -	W. M. Cunningham.

Barbados.—Dodd's Reformatory, Botanic Station :—

Superintendent -	John R. Bovell, F.L.S., F.C.S.
Assistant Superintendent.	C. T. Murphy.
Lecturer in Agricultural Science.	Longfield Smith, B.Sc., Ph.D.

Bermuda.—Botanic Station :—

Superintendent -	*Thomas J. Harris.

British Central Africa Protectorate.—

Forestry and Botanical Department :—

Zomba - -	Head of Department -	J. McClounie.
	Forester - - -	*J. M. Purves.
	Assistant Forester -	*E. W. Davy.

British East Africa Protectorate.—

Nairobi -	Director of Agriculture.	Andrew Linton, B.Sc.
	Assistant - - -	*Henry Powell.
	Forester - - -	——

British Guiana.—Botanic Gardens :—

Georgetown -	Superintendent - -	A. W. Bartlett, B.A. B.Sc., F.L.S.
	Head Gardener -	†John F. Waby, F.L.S.
	Assistant Gardener -	F. W. B. Carter.
	Agricultural Assistant	*Robert Ward.
Berbice - -	Keeper - - -	J. Nardamoonie.

British Honduras.—Botanic Station :—

Curator - - -	Eugene Campbell.

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Canada.—

Ottawa - -	Dominion Botanist -	Prof. John Macoun, M.A., F.R.S.C.
	Assistant „	Jas. M. Macoun.
	Director of Government Experimental Farms.	Prof. Wm. Saunders, C. M. G., LL. D., F.R.S.C., F.L.S.
	Director's Assistant and Superintendent of Botanic Garden.	W. T. Macoun.
	Botanist and Entomologist.	James Fletcher, F.R.S.C., F.L.S.
Montreal - -	Director, University Botanic Garden.	Prof. D. P. Penhallow, B.Sc., F.R.S.C.

Cape Colony.—

	Hon. Curator, Government Herbarium.	Prof. Pearson, M.A., F.L.S.
	Conservator of Forests	D. E. Hutchins.
	Gardens and Public Parks :—	
Cape Town -	Superintendent - -	H. J. Chalwin.
Grahamstown -	Curator - - -	Edwin Tidmarsh.
Port Elizabeth -	Superintendent - -	John T. Butters.
King Williamstown.	Curator - - -	George Lockie.
Graaff-Reinet -	„ - - -	*C. J. Howlett.
Uitenhage -	„ - - -	H. Fairey.

Ceylon.—Royal Botanic Gardens :—

Peradeniya -	Director - - -	†John C. Willis, Sc.D., F.L.S.
	Government Mycologist.	†T. Petch, B.A., B.Sc.
	Government Entomologist.	E. E. Green, F.E.S.
	Government Chemist	M. K. Bamber, F.I.C., F.C.S.
	Scientific Assistant -	A. M. Smith, B.A.
	Controller, Experiment Station.	Herbert Wright, F.L.S.
	Curator - - -	*Hugh F. Macmillan, F.L.S.
	Chief Clerk - -	R. H. Pereira.
	Draughtsman - -	A. de Alwis.
Hakgala - -	Curator - - -	J. K. Nock.
	Clerk and Foreman -	D. D. Fernando.

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Ceylon—*cont.*

Henaratgoda -	Conductor - -	H. W. Perera.
Nuwara Eliya -	„ - - -	D. Michael.
	Conservator of Forests - -	T. J. Campbell.

Cyprus.—

Principal Forest Officer.	A. K. Bovill.
Director of Agriculture.	D. Sarakomenos.

Dominica.—Botanic Station :—

Curator - - -	*Joseph Jones.
Agricultural Instructor.	——

Agricultural School :—

Officer in Charge -	*Archibald Brooks.

Egypt.—

Cairo.—Khedivial Agricultural Society :—

Secretary - - -	G. P. Foaden, B.Sc.

Falkland Islands.—Government House Garden :—

Head Gardener - -	*Albert Linney.

Federated Malay States.—Forest Department :—

Chief Forest Officer -	A. M. Burn-Murdoch.

Kuala Lumpur Agricultural Department :—

Director of Agriculture.	J. B. Carruthers, F.L.S.
Government Entomologist.	†H. C. Pratt.

Experimental Plantations :—

Superintendent -	*T. W. Main.

Perak (Taiping).—Government Gardens and Plantations :—

Superintendent - -	*J. W. Campbell.

Fiji.—Botanic Station :—

Curator - - - - -	*Daniel Yeoward.
Superintendent of Agriculture	Charles H. Knowles.

Gambia.—Botanic Station:—

Curator - - -	——

Gold Coast.—Botanic and Agricultural Department :—

Director of Agriculture.	——
Cotton-growing Expert	Edward Fisher.
Aburi - - Curator - -	*Alfred E. Evans.
Tarkwa - - „ - -	*James Anderson.
Kumasi (Ashanti) „ - -	*K. G. Burbridge.

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Grenada.—Botanic Garden :—

	Agricultural Superintendent.	R. D. Anstead, B.A.
	Agricultural Instructor.	G. F. Branch.

Hong Kong.—Botanic and Afforestation Department :—

	Superintendent -	*S. T. Dunn, B.A., F.L.S.
	Assistant Superintendent.	*W. J. Tutcher, F.L.S.

Jamaica.—Department of Public Gardens and Plantations :—

	Director - - -	†William Fawcett, B.Sc., F.L.S.
	Travelling Instructor	*William Cradwick.
	„ „	*William J. Thompson.
Hope Gardens and Experiment Station, Hill Gardens, and Castleton Gardens.	Superintendent -	*William Harris, F.L.S.
Castleton Gardens	Assistant Superintendent.	John Campbell.
Hope Gardens and Experiment Station.	Assistant Superintendent and Agricultural Instructor.	N. A. Rudolf.
Kingston Parade Garden.	Superintendent - -	*William J. Thompson.
King's House Garden.	„ - -	James Briscoe.
	Lecturer in Agricultural Science -	E. J. Wortley.

Lagos.—

Director of Agriculture and Forests -	J. H. J. Farquhar, B.Sc.
Assistant Conservator of Forests -	*E. W. Foster.
Botanic Station :—	
Curator - - -	*J. L. Williams.
Assistant - - -	*T. B. Dawodu.

Malta.—Argotti Botanic Garden :—

Director - - -	Dr. Francesco Debono.

Mauritius.—Department of Forests and Botanic Gardens :—

Pamplemousses-	Director - - -	——
	1st Assistant - -	Paul Koenig.
	2nd „ - - -	S. E. Pougnet.
	Overseer - - -	— Farrell.
Curepipe - -	„ - - -	F. Bijoux.
Reduit - -	„ - - -	W. A. Kennedy.
	Forest Officer - - -	F. Gleadow.

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Montserrat.—Botanic Station :—

	Curator - - -	*W. Robson.
	Agricultural Instructor.	Dudley Johnson.

Natal.—Botanic Gardens :—

Durban - -	Director - - -	John Medley Wood, A.L.S.
	Curator - - -	*James Wylie.
Pietermaritzburg	Curator - - -	*Alexander Hislop.
Conservator of Forests	- -	*T. R. Sim, F.L.S.

New South Wales.—Botanic Gardens :—

Sydney - -	Director and Government Botanist.	J. H. Maiden, F.L.S.
	Superintendent -	George Harwood.
	Botanical Assistant -	E. Betche.
Technological Museum :—		
	Curator - - -	R. T. Baker, F.L.S.

New Zealand.—

Wellington.—Department of Agriculture :—		
	Biologist - - -	T. W. Kirk, F.L.S.
State Forest Department :—		
	Chief Forester - -	Henry John Matthews.
Colonial Botanic Garden :—		
	Head Gardener -	——
Dunedin - -	Superintendent - -	*D. Tannock.
Napier - -	„ - -	W. Barton.
Invercargill -	Head Gardener - -	——
Auckland - -	Ranger - - -	William Goldie.
Christchurch -	Head Gardener - -	*Ambrose Taylor.

Northern Nigeria.—

	Conservator of Forests	——
	Assistant Conservator	*W. R. Elliott.

Orange River Colony.—Department of Agriculture :—

	Chief of Forestry Division.	K. A. Carlson.

Queensland.—Botanic Department :—

Brisbane - -	Colonial Botanist -	F. M. Bailey, F.L.S.
Botanic Gardens :—		
	Director - - -	J. F. Bailey.
	Overseer - - -	J. Tobin.
Acclimatisation Society's Gardens :—		
	Secretary - - -	——
	Overseer - - -	James Mitchell.
Forest Department :—		
	Director - - -	*Philip MacMahon.
Rockhampton -	Superintendent - -	R. Simmons.

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Rhodesia.—

Bulawayo.—Rhodes Matopo Park :—

	Curator - - -	W. E. Dowsett.

St. Kitts-Nevis.—Botanic Station :—

	Agricultural Superintendent.	F. R. Shepherd.
	Agricultural Instructor (Nevis).	J. S. Hollings.
Agricultural School :—		
	Officer in Charge -	John Belling, B.Sc.

St. Lucia.—Botanic Station :—

	Agricultural Superintendent.	*John Chisnall Moore.
	Agricultural Instructor.	George S. Hudson.

St. Vincent.—Botanic Station :—

	Curator - - -	*W. N. Sands.
	Agricultural Instructor.	Thomas Osment.
Agricultural School :—		
	Officer in Charge -	*W. H. Patterson.

Seychelles.—Botanic Station :—

	Curator - - -	R. Dupont.

Sierra Leone.—Botanic Station :—

	Curator - - -	*C. W. Smythe.

Soudan.—

Khartoum -	Director of Woods and Forests.	A. F. Broun.
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Curator - - -	*Henry Millen.
Agricultural Instructor.	N. Lord.

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Reporter on Economic Products to the Government of India, Indian Museum, Calcutta	†Sir George Watt, M.B., C.M., C.I.E., F.L.S.
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